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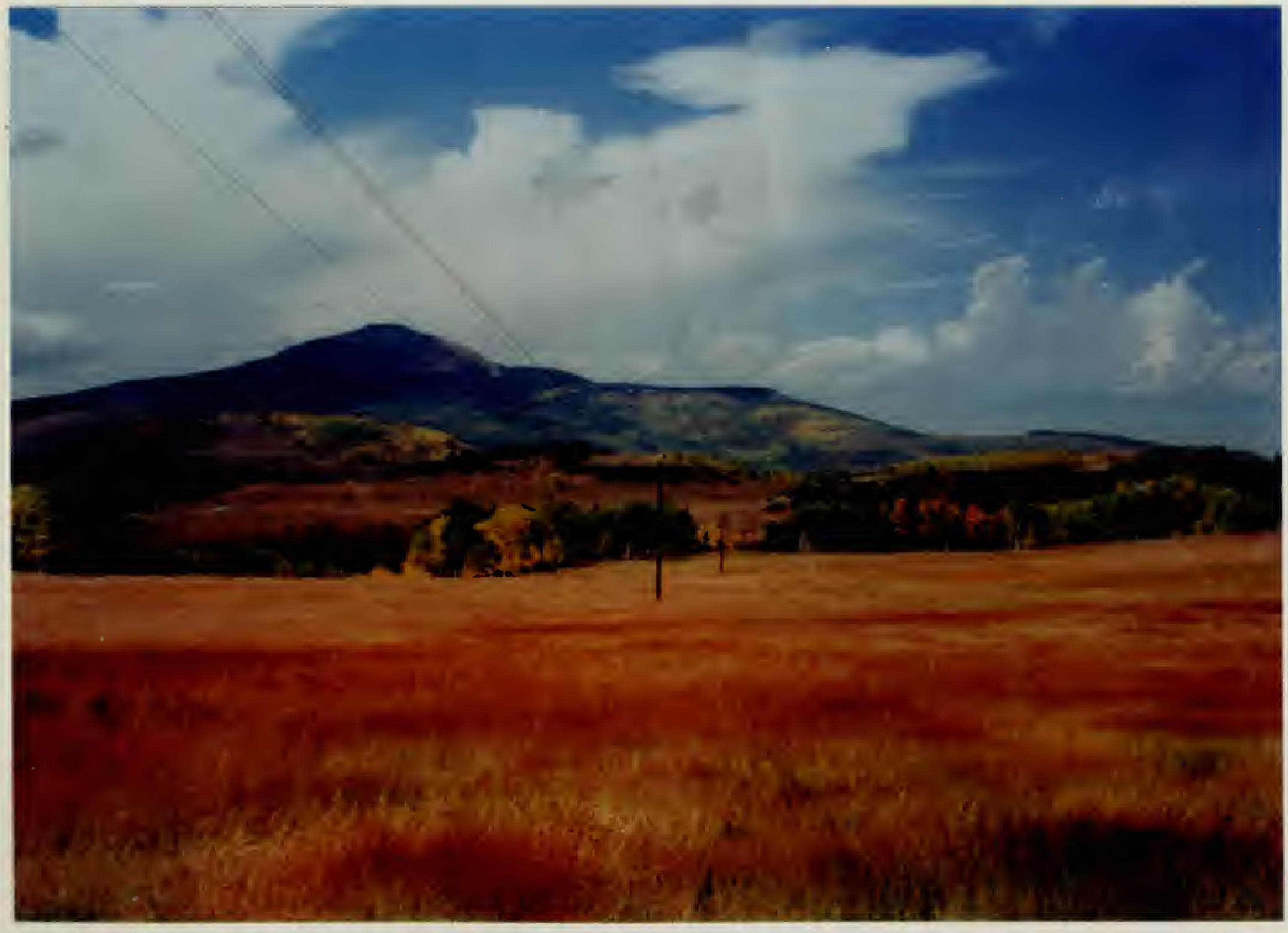
FINAL

ENVIRONMENTAL IMPACT STATEMENT

Nucla-Telluride Transmission Line Project



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VOLUME I

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Final Environmental Impact Statement
Nucla-Telluride Transmission Line Project
Montrose and San Miguel Counties, Colorado
November 2001

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Abstract: The Nucla-Telluride Transmission Line Project Final Environmental Impact Statement (FEIS) describes the affected environment and environmental consequences of constructing and operating a new 115 kV transmission line between the Nucla Substation in Montrose County, Colorado and either the Telluride or Sunshine Substations in San Miguel County, Colorado. The primary federal action entails whether to approve the necessary permits to construct and operate the proposed project across federal lands administered by the USDA, Forest Service, and the USDI, BLM. Decisions of the RUS relate to whether to provide federal funding for the project. The project is being proposed by Tri-State Generation and Transmission Association (Tri-State) in order to improve the reliability and quality of electric power service in the Telluride Area and surrounding communities, as well as alleviate system overloads on the regional transmission grid.

The 115 kV transmission line would be approximately 45 to 48 miles long, depending upon the alternative selected. Key issues include visual impacts to sensitive areas, including the Uncompahgre National Forest (UNF), the San Juan Skyway Scenic Byway, the San Miguel River Canyon Special Recreation Management Area and Area of Critical Environmental Concern, other public lands and trails valued for recreation uses and private residential areas and developments. Key issues also include the need for a reliable source of backup power to the Telluride region and surrounding project area communities due to both public health and safety reasons. Alternatives developed in this EIS address the key issues raised during scoping. Transmission alternatives are organized by their physical location between necessary substation interconnections. Between the Nucla and Norwood Substations, three primary alternatives are evaluated: the Nucla-Norwood Northern Alternative, the Nucla-Norwood Central Alternative, and the Nucla-Norwood Southern Alternative. East of the Norwood Substation, two primary alternatives are evaluated: the Norwood-Sunshine Alternative and the Norwood-Telluride Alternative. The proposed transmission project would entail combining one of the Nucla-Norwood alternatives with either the Norwood-Sunshine or Norwood-Telluride Alternative. Each of the transmission alternatives also consists of modifications to San Miguel Power Associations (SMPA) substations and distribution lines.

A number of subalternatives are also evaluated in the EIS, including minor routing and substation variations, and an underground alternative across scenic portions of Beaver, Wilson, Specie and Sunshine Mesas. Other technology alternatives to the transmission project are also disclosed, including three Distributed Generation (DG) scenarios. In addition to the generator(s) and natural gas pipeline extensions, the DG Alternatives would require transmission and substation modifications similar to the proposed 115 kV transmission project.

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AADT	Average Annual Daily Traffic
AAQS	Ambient Air Quality Standards
A.D.	Anno Domini *(in the year of the Lord)*
ADC	Aid to Dependent Children
ADT	Average Daily Traffic
AC	Alternating Current
ACEC	Areas of Critical Environmental Concern
ACHP	Advisory Council on Historic Preservation
ACOE	(United States) Army Corps of Engineers
ACSR	Aluminum Conductor Steel Reinforced
AESC	Alternative Energy Systems Consulting, Inc.
A.M.	Amplitude modulation
AN	Audible noise
ANSI	American National Standards Institute
APCD	Air Pollution Control District
APE	Area of Potential Effect
APLIC	Avian Power Line Interaction Committee
AQCC	Air Quality Control Commission
ATV	All Terrain Vehicle
AUM	Animal Units per Month
A-weighted	Scale for recording noise levels
BA	Biological Assessment
B.C.	Before Christ
BE	Biological Evaluation
BG	Background
BLM	Bureau of Land Management
BMP	Best Management Practices
BOCC	Board of County Commissioners
CAA	Clean Air Act
CCA	Chromated copper arsenate
CCC	Civilian Conservation Corps
CDOH	Colorado Department of Health
CDHAPCD	Colorado Department of Health, Air Pollution Control Division
CDLE	Colorado Department of Labor and Employment
CDLG	Colorado Division of Local Governments
CDOT	Colorado Department of Transportation
CDOW	Colorado Division of Wildlife
CDP	(San Miguel County) Comprehensive Development Plan
CDPHE	Colorado Department of Health and Environment
CFR	Code of Federal Regulations
CGS	Colorado Geological Survey
CNHP	Colorado Natural Heritage Program
CNPS	Colorado Native Plant Society
CO	Carbon Monoxide
CO&M Plan	Construction, Operation and Maintenance Plan
COE	Army Corps of Engineers
CPAC	Citizen Planning Advisory Committee
CPUC	Colorado Public Utilities Commission
CRS	Colorado Revised Statute
CSLB	Colorado State Land Board
CUS	Competitive Utility Strategies
CWA	Clean Water Act
dB	Decibels
dBA	A-weighted decibel scale
DC	Direct Current
DEIS	Draft Environmental Impact Statement
DG	Distributed Generation
DMEA	Delta Montrose Electric Association
DOE	Department of Energy
DSM	Demand Side Management

EA	Environmental Assessment
e.g.	*exempli gratia*, (L.), for example
EIS	Environmental Impact Statement
EMF	Electric and Magnetic Fields
Empire	Empire Electric Association
EMT	Emergency Medical Technician
EPA	Environmental Protection Agency
EPM	Environmental Protection Measures
EPRI	Electric Power Research Institute
ESA	Endangered Species Act
FAA	Federal Aviation Administration
FEIS	Final Environmental Impact Statement
FEMA	Federal Emergency Management Agency
FERC	Federal Energy Regulatory Commission
FG	Foreground
FMPs	Fire Management Practices
FONSI	Finding of No Significant Impact
Forest Service	United States Forest Service
FS	United States Forest Service
G	Gauss
GIS	Geographic Information System
GMUG	Grand Mesa, Uncompahgre and Gunnison National Forest
HC	Hydrocarbons
HC	Heavy Commercial
HCPO	Hopi Cultural Preservation Office
HDD	Horizontal Directional Drilling
HMP	Habitat Management Plans
HNA	Housing Needs Assessment
HPGF	High Pressure Gas Filled
Hz	Hertz
I	(Low Intensity) Industrial
i.e.	*id est* (L.), that is
IITR	Illinois Institute of Technology Research
INIRC	International Non-Ionizing Radiation Committee
IRPA	International Radiation Protection Association
KEA	KEA Environmental, Inc.
kHz	Kilohertz
KOP	Key Observation Point
kV	Kilovolts
kV/m	Kilovolts per Meter
KW	Kilowatt
LaPlata	LaPlata Electric Association
L_{dn}	Daytime and nighttime equivalent noise level(s)
LOS	Levels of Service
LUC	(San Miguel County) Land Use Code
LUO	Town of Mountain Village Land Use Ordinance
M	Meter
mA	Milliamperes
mG	Millegauss
MG	Middleground
MGD	Million Gallons per Day
MHz	Megahertz
mm	Millimeters
mph	Miles per hour
MVA	Megavolt amps
MVAR	Megavar
MW	Megawatts
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NESC	National Electric Safety Code
NF	National Forest
NFMA	National Forest Management Act
NFSAPA	National Forest Ski Area Permit Act
NO_2	Nitrogen Dioxide
NO_x	Nitrogen Oxides

NOI	Notice of Intent
NPDES	National Pollutant Discharge Elimination System
NRC	National Academy of Science/National Research Council
NRCS	National Resources Conservation Service
NRHP	National Register of Historic Places
NWI	National Wetland Inventory
NWS	National Weather Service
O_3	Ozone
OAHP	Office of Archaeology and Historical Preservation
OHV	Off Highway Vehicle
OSHA	U.S. Department of Labor Occupational Safety and Health Standards
P	Primitive
P&Z	Planning and Zoning
pers. comm.	Personal communication
PM_{10}	Particulate matter with an aerodynamic size equal or less than 10 microns
ppm	Parts per million
PUD	Planned Urban Development
PVC	Polyvinylchloride
R	Rural
RCP	Required Construction Practices
RI	Radio Interference
RI/TVI	Radio Interference/Television Interference
RMP	Resource Management Plan
RN	Roaded Natural
ROD	Record of Decision
ROS	Recreation Opportunity Spectrum
ROW	Right-of-way
RTP	Regional Transportation Plan
RUS	Rural Utility Service
RVD	Recreation Visitor Days
SCS	Soil Conservation Service
SH	State Highway
SHPO	State Historic Preservation Officer
SIP	State Implementation Plan
SMC	San Miguel County
SMERG	San Miguel Energy Research Group
SMPA	San Miguel Power Association
SMVC	San Miguel Valley Corporation
SMWC	San Miguel Watershed Coalition
SO_2	Sulfur Dioxide
SO_x	Sulfates
SOP	Standard Operating Procedures
SPCC	Soil Prevention Control and Countermeasure (Plan)
SPM	Semi-Primitive Motorized
SPNM	Semi-Primitive Non-Motorized
Sq. Mi.	Square Mile
SR	State Road
SRMA	Special Recreation Management Area
TCP	Traditional Cultural Properties
Telski	Telluride Ski & Golf Company
T&E species (TES)	Threatened and Endangered Species (As defined by the Endangered Species Act)
TNC	The Nature Conservancy
TOU	Time-of-use
TPII	Telecam Partnership II
Tri-State	Tri-State Generation and Transmission Association, Inc.
TSP	Total Suspended Particulate
TVI	Television Interference
U	Urban
Ug/m_3	Micrograms per cubic meter
UHC	Unburned hydrocarbons
USDA	United States Department of Agriculture
USDI	United States Department of the Interior
UNF	Uncompahgre National Forest
USFS	United States Forest Service
USFWS	United States Fish and Wildlife Service

USGS	United States Geological Survey
UTM	Universal Transverse Mercator
VAC	Visual Absorption Capacity
V/m	Volts per Meter
VQO	Visual Quality Objectives
VRM	Visual Resource Management
WAPA	Western Area Power Administration
Western	Western Area Power Administration
WPA	Works Progress Administration
WSCC	Western Systems Coordinating Council
XLPE	Solid Dialectric Cable

Summary

SUMMARY

INTRODUCTION

Tri-State Generation and Transmission Association (Tri-State) is proposing to construct and operate a new single-circuit 115 kilovolt (kV) transmission line in southwestern Colorado between the Nucla Substation and either the Sunshine Substation or the Telluride Substation. This document is a summary of the Nucla-Telluride Transmission Line Project Final Environmental Impact Statement (FEIS). The EIS analyzes the proposed action and alternatives, and describes their environmental effects on federal, state and private lands. ***Figure SUMMARY-1*** shows the project vicinity and transmission alternatives under consideration.

The FEIS has been prepared in compliance with the National Environmental Policy Act of 1969 (NEPA). The U.S. Department of Agriculture (USDA) Forest Service, Rocky Mountain Region, Grand Mesa, Uncompahgre and Gunnison (GMUG) National Forests (Forest Service) is the federal lead agency for NEPA compliance. The U.S. Department of Interior (USDI) Bureau of Land Management (BLM) and the USDA Rural Utilities Service (RUS) are cooperating federal agencies in the NEPA process. The Draft EIS (DEIS) was published for public review in March 2001. The FEIS incorporates changes and modifications to the DEIS based upon comments received from the public and federal and state agencies.

PURPOSE AND NEED

In 1998 Tri-State proposed to rebuild and replace the existing 69 kV transmission line between the Nucla and Sunshine Substations. Tri-State's proposal would affect National Forest, BLM and private lands. Tri-State has identified the need to replace the existing 69 kV line with a single-circuit 115 kV transmission line for the following reasons:

1. To alleviate regional system overloads and improve load serving capacity in southwestern Colorado;
2. To provide a long-term source of reliable power to the Telluride Area;
3. To improve the quality of electrical power service to a number of smaller communities in the region, including Telluride, Norwood, Rockwood, Purgatory and Silverton; and
4. To increase the load serving capacity of the transmission system in southwestern Colorado.

The existing Nucla-Sunshine 69 kV line is more than 50 years old and has a capacity of 13 megawatts (MW). The proposed 115 kV line would have a capacity of approximately 55 MW.

Alleviating Regional System Overloads and Increasing Load Serving Capacity - The southwestern Colorado regional power system, termed 'TOT2A', encompasses the area between Montrose, Colorado and the New Mexico/Colorado border. Tri-State is responsible for transferring power to both their local cooperative members and to regional customers through their transmission grid. The regional electrical grid is operated for two primary purposes: to reliably serve the existing and projected loads in the region; and to provide bulk power transfers through the region for the Western Area Power Administration. Power system planning for the region is coordinated through the Western Systems Coordinating Council (WSCC), that is composed of a number of utilities. Planning studies conducted by Tri-State in the mid-1990s for the WSCC concluded that overload conditions on the regional grid would result in low voltages and system overloads in the future. In order to remedy the

regional electrical grid problems, Tri-State is planning on making a number of system modifications, including replacing the existing 69 kV Nucla-Sunshine line with a new 115 kV system.

If approved by federal, state and local permitting agencies, the replacement of the existing Nucla-Sunshine 69 kV line with a 115 kV system would help Tri-State meet their obligations for bulk power transfers while at the same time providing a reliable source of power to the Telluride Area for the foreseeable future. The proposed transmission line would provide an additional 15 MW of benefits for regional power transfers on the TOT2A grid, and would increase the southwestern Colorado load serving capacity by 30 MW. Other local communities would also benefit from improved quality of power service.

Improving Power Reliability and Quality of Service for the Telluride Area and Surrounding Communities - Southwestern Colorado, and in particular the Telluride Area, has been and continues to experience significant increases in power demand due to the growing population and related expansions of the ski area and tourism economy. Power to the Telluride Area is provided by San Miguel Power Association (SMPA), a cooperative member of Tri-State. SMPA estimates that by 2015, annual peak demands in Telluride and the surrounding area may reach approximately 30 to 32 MW. The Telluride Area receives its primary power supply from the Hesperus-Telluride 115 kV transmission line. This line has a capacity of 32 MW and will be able to meet the Telluride Area's power demands into the foreseeable future.

The Hesperus-Telluride line is subject to major hazards and power outage risks, however, due to its location across rugged mountainous terrain, including Ophir, Molas and Coal Bank Passes. These mountain passes routinely experience severe winter weather including heavy snowfalls, avalanches, and high winds. Until recently, the 13 MW of power that is available from the Nucla-Sunshine 69 kV line was sufficient to provide backup power to Telluride in the event of an outage on the Hesperus-Telluride line. Due to the growing demand for power in the Telluride Area, this 13 MW of power can no longer fully back up the loads in Telluride, particularly during the winter months when demand is highest.

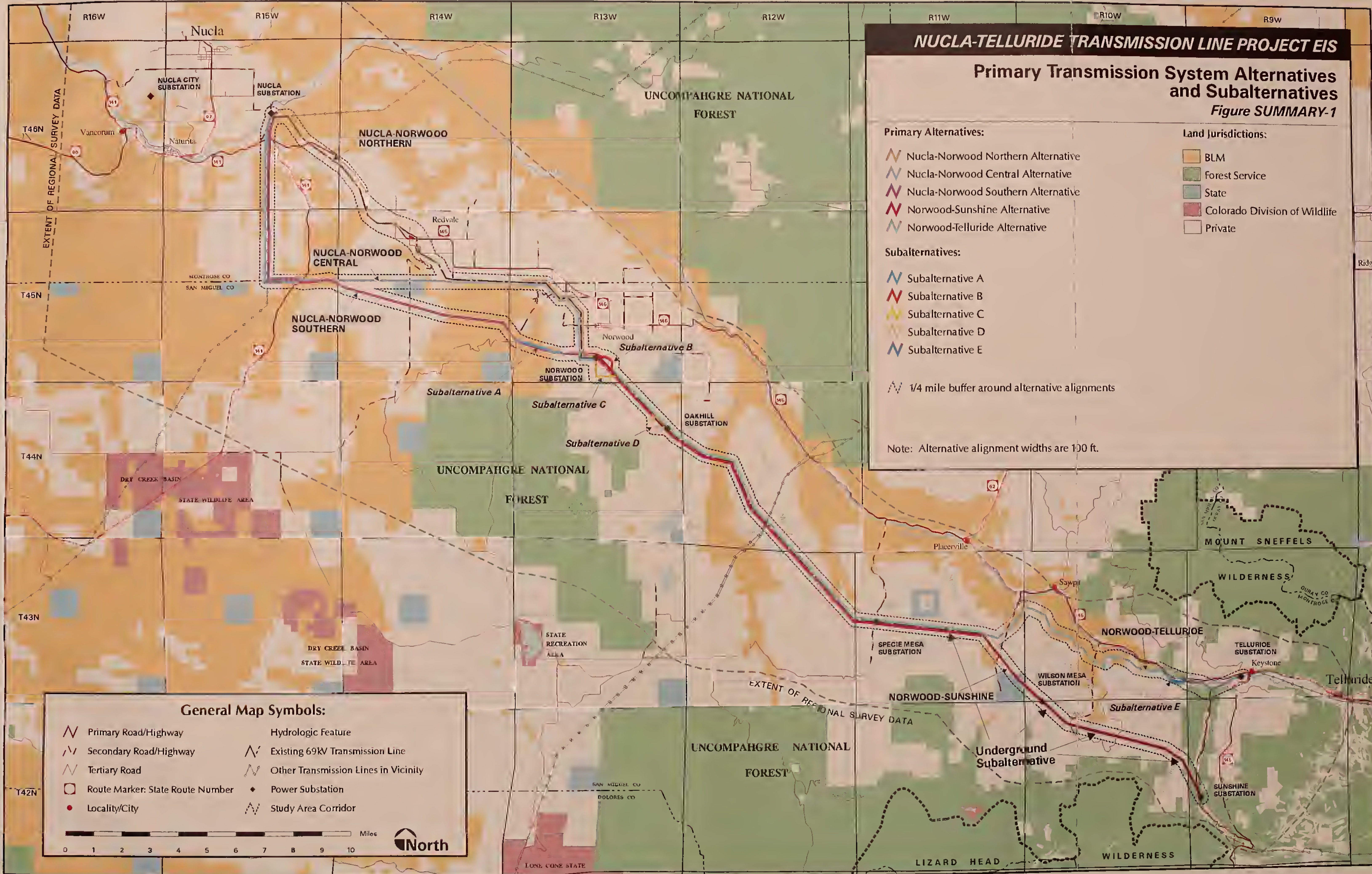
The ramifications of not having a reliable source of backup power in the Telluride Area are significant and include risks to human health and safety as well as the local tourism economy. Should an outage on the Hesperus-Telluride line occur during the winter, an extended outage could occur in Telluride, Mountain Village and surrounding communities such as Ophir and Placerville, and to residents of Wilson, Sunshine and Specie Mesas. During emergency conditions, the existing Nucla-Sunshine 69 kV line can be operated in a manner to provide up to 26 MW of power.[1] This option, however, will soon be insufficient to cover the winter power loads. An extended outage would affect a number of community services and functions that do not have individual backup generators.

A number of other communities are also at risk of increasing power outages and unreliable power supplies given the age and continuing deterioration of the 50-year-old Nucla-Sunshine 69 kV line. Outages from increasing maintenance, lightning strikes and other causes are resulting in less reliable power service to residents of Norwood, Wrights Mesa and surrounding rural areas.

THE PROPOSED ACTION

Tri-State has stated that the proposed 115 kV transmission line could connect between the

[1] *Tri-State's operating criteria would only allow voltage drops resulting from using the Nucla-Sunshine 69 kV circuit to support the Telluride loads (26 MW) for no longer than 20 minutes.*



NUCLA-TELLURIDE TRANSMISSION LINE PROJECT EIS
Primary Transmission System Alternatives and Subalternatives
Figure SUMMARY-1
Primary Alternatives:
Nucla-Norwood Northern Alternative
Nucla-Norwood Central Alternative
Nucla-Norwood Southern Alternative
Norwood-Sunshine Alternative
Norwood-Telluride Alternative
Subalternatives:
Subalternative A
Subalternative B
Subalternative C
Subalternative D
Subalternative E
1/4 mile buffer around alternative alignments
Note: Alternative alignment widths are 100 ft.
Land Jurisdictions:
BLM
Forest Service
State
Colorado Division of Wildlife
Private
General Map Symbols:
Primary Road/Highway
Secondary Road/Highway
Tertiary Road
Route Marker: State Route Number
Locality/City
Hydrologic Feature
Existing 69kV Transmission Line
Other Transmission Lines in Vicinity
Power Substation
Study Area Corridor
Miles
0 1 2 3 4 5 6 7 8 9 10
North
R16W
R15W
R14W
R13W
R12W
R11W
R10W
R9W
T46N
T45N
T44N
T43N
T42N
Nucla
NUCLA CITY SUBSTATION
NUCLA SUBSTATION
Vancorum
Naturita
EXTENT OF REGIONAL SURVEY DATA
NUCLA-NORWOOD NORTHERN
NUCLA-NORWOOD CENTRAL
NUCLA-NORWOOD SOUTHERN
Redvale
MONTROSE CO
SAN MIGUEL CO
UNCOMPAHGRE NATIONAL FOREST
Norwood
Subalternative B
NORWOOD SUBSTATION
Subalternative A
Subalternative C
Subalternative D
OAKHILL SUBSTATION
DRY CREEK BASIN
STATE WILDLIFE AREA
UNCOMPAHGRE NATIONAL FOREST
STATE RECREATION AREA
Placerville
Sawpit
MOUNT SNEFFELS
WILDERNESS
NORWOOD-TELLURIDE
TELLURIDE SUBSTATION
Keystone
Telluride
SPECIE MESA SUBSTATION
WILSON MESA SUBSTATION
NORWOOD-SUNSHINE
Subalternative E
EXTENT OF REGIONAL SURVEY DATA
UNCOMPAHGRE NATIONAL FOREST
Underground Subalternative
SAN MIGUEL CO
DOLORES CO
SUNSHINE SUBSTATION
LIZARD HEAD
WILDERNESS
LONE CONE STATE

Nucla Substation in Montrose County and either the Telluride Substation or the Sunshine Substation in San Miguel County. The 115 kV line would be supported on wood poles. Structure designs would vary from single poles to H-frame or three-pole structures depending upon engineering requirements and landowner wishes. The new transmission line would be 70 feet tall on average, approximately twice as tall as the existing 69 kV wood poles. ***Figure SUMMARY-2*** shows representative transmission pole designs. Increased pole heights are needed to meet present-day design standards required by the RUS for funding. Present-day pole designs provide adequate spacing between conductors for raptor protection, necessary ground clearances for public safety, as well as inclusion of a static line for lightning protection. The static line would also contain fiber optic cable that would be available to local providers of high-speed Internet services. Right-of-way requirements would vary between 75 feet and 100 feet depending on the pole type.

The replacement of the 69 kV line with a 115 kV line would also require a number of modifications to SMPA substations and distribution lines. The Norwood Substation, a necessary interconnection for all routing options, would need to be enlarged to approximately 2 acres. Only minor changes would be required at the Nucla, Sunshine, Wilson Mesa and Specie Mesa Substations. The Oak Hill Substation would be removed. Changes to the distribution system would entail extending, replacing or relocating small sections of distribution lines.

PUBLIC SCOPING AND DEIS COMMENTS

PUBLIC SCOPING

In accordance with the requirements of NEPA, the Forest Service held a number of public scoping meetings to document the issues associated with this Project, to identify feasible alternatives and to determine the scope of the EIS analysis. Workshops and meetings were noticed and held on February 24, 25, March 19, May 26, 27, 28 and August 19, 1998. The Notice of Intent (NOI) was published in the Federal Register on April 30, 1998. The San Miguel Energy Resource Group (SMERG) also provided input into this process in 1999 through their work for the San Miguel County Commissioners regarding energy options for the Telluride Area.

Major issues raised during this process included alternative routing options, alternative designs such as undergrounding the line or rebuilding it as a 69 kV line; and alternative technologies, such as distributed generation (DG) and hydroelectric options. Environmental and social issues that were raised during scoping included avoiding or minimizing effects to a variety of sensitive resources, among others - impacts to natural scenery, biologically sensitive areas, residential and recreation areas, and areas susceptible to unstable conditions due to soils, geology, or avalanche hazards. Scoping issues are summarized in Volume I, Chapter 1.0 of the FEIS.

PUBLIC COMMENTS ON DEIS

The DEIS for the Nucla-Telluride Transmission Line Project was released for public review on March 31, 2001. The USFS announced the public comment period in local newspapers and regional media in March 2001, and in the Federal Register, Vol. 66, No. 62, March 30, 2001 (Notice of Availability, EIS No. 010095). The comment period extended until May 31, 2001. In total, 61 days were available for public review and comment.

During the public review period, 85 comment letters and e-mails were received.

- **Federal Agencies** -- Comments were received from 3 federal agencies, including Army Corps of Engineers, Department of Energy, and Department of the Interior.

- **State Agencies** -- Comments from 2 state agencies were received including the Colorado Division of Wildlife and the Colorado Department of Transportation.
- **County Agencies** – No substantive comments were received from either Montrose or San Miguel Counties.

General Public – 80 comments were received from special interest groups and private citizens. Special interest groups include the Sheep Mountain Alliance, the San Miguel Energy Resource Group, Friends of Naturita Canyon, Norwood Gardens Homeowners Association, Ptarmigan Ranch Owners Association, and Wilson Mesa Homeowners Association. Tri-State Generation and Transmission Association (Tri-State) and San Miguel Power Association (SMPA) also provided comments. The remainder of comments was made by private citizens.

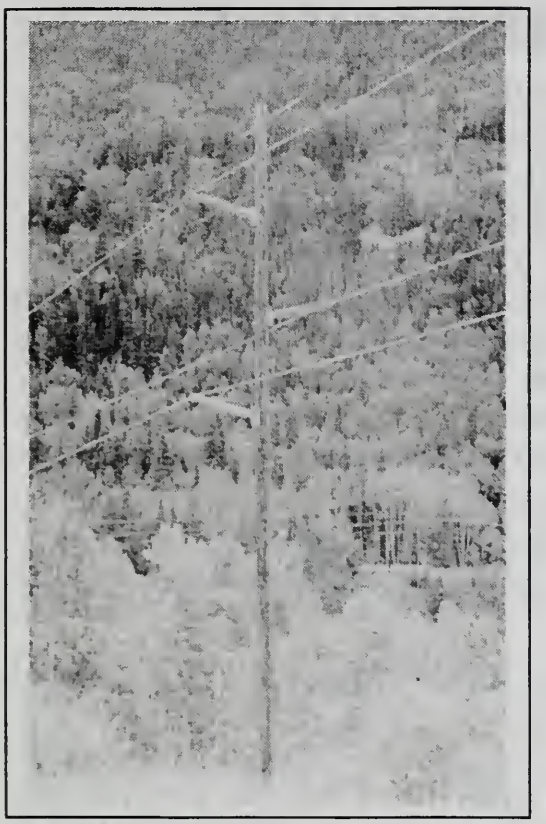
The following issues were raised most often in comments on the DEIS:

1. Impacts to scenic quality and public and private views
2. Impacts to property values and land uses
3. Potential for undergrounding and associated costs of underground versus overhead transmission systems
4. Tri-State's Undergrounding Policy
5. Effects associated with changes to SMPA's distribution system and substations
6. Legal status of the existing 69 kV easements
7. Purpose and need
8. Range of alternatives
9. Biological resource effects
10. Water and wetland effects
11. Public health and safety

RANGE OF ALTERNATIVES CONSIDERED IN THE EIS

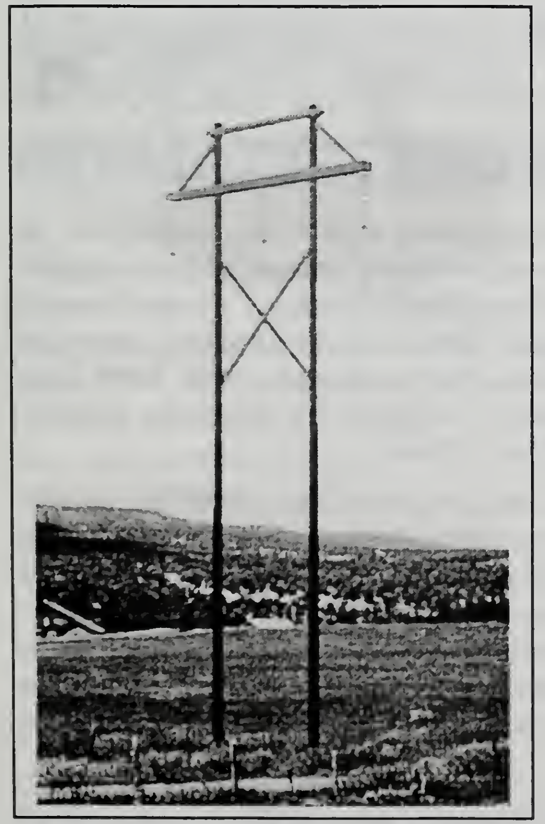
A range of feasible alternatives was identified from public scoping and comments on the DEIS. Alternatives evaluated in the Nucla-Telluride FEIS respond to Tri-State's stated need for alleviating regional power overload conditions and improving power reliability and service in the local communities served by SMPA and other cooperative members. The range of alternatives is also responsive to scoping comments regarding environmental and social issues and alternative energy options. The types of alternatives considered are:

- *Primary Transmission Line Routing Alternatives* – between the Nucla, Norwood and Sunshine or Telluride Substations;
- *Transmission Line and Substation Subalternatives*. These include minor routing adjustments, an alternative site for the Norwood Substation, and an Underground Subalternative across portions of Beaver, Specie, Wilson and Sunshine Mesas;
- *Distributed Generation Alternatives* to the 115 kV Transmission Line proposal; including three scenarios that meet Tri-State's purpose and need to varying degrees; and
- *the No Action Alternative*, that would entail the federal agencies not issuing permits for Tri-State's Proposed Action.



Proposed 115 kV Single-Circuit Line
(Single Pole Structure – Avg. Height 70 ft.)

Existing 69 kV Single Pole Structure
Nucla-Sunshine Line
(Avg. Height 40 ft.)



Simulation of Proposed 115 kV
Single-Circuit Line
(H-frame Structure – Avg. Height 70 ft.)

Simulation of Typical 115 kV Single Pole
Structure with Distribution Underbuilt
(Avg. Height 75 ft.)

Figure SUMMARY-2
Representative Transmission Pole Designs

PRIMARY TRANSMISSION LINE ROUTING ALTERNATIVES

The EIS analyzes three primary action alternatives between the Nucla and Norwood Substations and two primary action alternatives between Norwood and the project termination point, at either the Telluride or Sunshine Substation. Total routing alternatives would be achieved by combining any of the Nucla-Norwood Alternatives with either the Norwood-Sunshine or Norwood-Telluride Alternative. ***Figure SUMMARY-1*** shows the geographic location of these action alternatives. Each of the action alternatives would result in a range of impacts and addresses the scoping issues with varying degrees of success. The alternatives were identified by considering the regional constraints and opportunities of the project area and Tri-State's electrical system requirements. The primary alternatives consist of the following electrical system and corridor location options:

The Nucla-Norwood Northern Alternative would consist of rebuilding the existing 69 kV line to 115 kV in its current location between these two substations. This alternative primarily crosses through agricultural lands of Montrose and San Miguel Counties and traverses the community of Redvale.

The Nucla-Norwood Central Alternative would entail locating the 115 kV line parallel to Tri-State's Nucla-Cahone 115 kV line for approximately six miles, and paralleling the San Miguel and Montrose County boundary for approximately 9.7 miles. This alternative would avoid most agricultural lands in Montrose County, run parallel to the north rim of Naturita Canyon, and cross BLM lands for several miles. The Central Alternative would also entail rebuilding a section of the 69 kV line to 115 kV north and west of Norwood, where agricultural lands and the Norwood Gardens Subdivision would be crossed in San Miguel County.

The Nucla-Norwood Southern Alternative would also parallel the Nucla-Cahone 115 kV line and the Montrose/San Miguel County boundary for six miles, before traversing southeast across BLM and private lands of San Miguel County. This alternative would avoid most irrigated agriculture by following existing seismic exploration lines across BLM lands and crossing a central section of Naturita Canyon. Similar to the Northern and Central Alternatives, the Southern Alternative would cross through some agricultural lands near the Norwood Substation.

The Norwood-Sunshine Alternative would entail rebuilding the existing 69 kV line to 115 kV in its current location. This alternative would cross open meadows and mesas of San Miguel County, as well as a number of canyons including Beaver Creek, Saltado Creek, Specie Creek, Fall Creek and the South Fork of the San Miguel River. Lands crossed by this alternative are primarily private lands in San Miguel County, although some BLM and Forest Service lands would also be affected. This alternative crosses the southern part of Ilium Valley, approximately 0.5 mile north of the Ames Power Plant.

The Norwood-Telluride Alternative consists of rebuilding the existing 69 kV line to 115 kV across Beaver and Specie Mesas before establishing a new utility corridor across the slopes and benches of the San Miguel River Canyon. This alternative would cross a combination of BLM and private lands, as well as Forest Service lands near the Telluride Substation. Canyons crossed by this alternative include Beaver Creek, Saltado Creek, Specie Creek, Fall Creek, Bear Creek, the San Miguel River Canyon, Bilk Creek, and the South Fork of the San Miguel River. The Norwood-Telluride Alternative crosses the northern end of Ilium Valley, near the Mary E. Day Use Area.

TRANSMISSION LINE AND SUBSTATION ALTERNATIVES

Overhead Transmission Routing Subalternatives A, B, C, D, and E A number of subalternatives are also evaluated in the EIS. These are minor routing variations or substation site changes that are being considered. Most subalternatives were identified during scoping, and include various routing options at Naturita Canyon, near the Norwood Substation, and near the

Telluride Substation, among others. The general vicinity of the Subalternatives is shown in *Figure SUMMARY-1.* Subalternative A is an alternative routing across Naturita Canyon for the Nucla-Norwood Southern Alternative; Subalternatives B, C, and D are minor routing alternatives to portions of the Norwood-Sunshine and Norwood-Telluride Alternatives that pass through sensitive residential and agricultural areas. Subalternative E applies only to the Norwood-Telluride Alternative, and provides an alternative that would avoid two crossings of the San Juan Skyway National Scenic Byway by staying closer to the San Miguel River.

Underground Subalternative During scoping the public suggested undergrounding the line as a way to avoid visual impacts to scenic areas of San Miguel County. Numerous comments were also received on this issue during the public review period for the DEIS. Although undergrounding of transmission lines is considered technically feasible and is often done in urban environments, this technology is not considered feasible nor practical for the entire length of the Project due to the mountainous and steep canyon terrain that must be crossed. Tri-State has a policy regarding undergrounding the line that states that landowners must absorb the difference in costs between overhead and underground construction. Undergrounding costs are typically 7 to 10 times the costs of overhead construction.

The FEIS evaluates undergrounding, as a subalternative across portions of Beaver, Specie, Wilson and Sunshine Mesas. In these locales, undergrounding is considered technically feasible. Since these lands are privately owned rather than public lands, the EIS analysis is limited to disclosing the major environmental and cost tradeoffs for purposes of public disclosure. San Miguel County will be the primary agency responsible for permitting the Project across private lands in the county. The Forest Service and BLM have no decision-making authority for this subalternative and have no position regarding Tri-State's underground policy. RUS has reviewed Tri-State's policy concerning undergrounding transmission facilities and found it to be a reasonable and prudent policy.

Norwood Substation Alternative Site B This subalternative considers an alternate site for locating an enlarged Norwood Substation.

DISTRIBUTED GENERATION (DG) ALTERNATIVES

In response to public scoping comments and a report prepared by Competitive Utility Strategies (CUS) for SMERG in 1999, the EIS considers three distributed generation alternatives to Tri-State's proposed 115 kV Project. Distributed generation options have been suggested by SMERG as a way to avoid impacting sensitive lands of San Miguel County. In early 2000, the Forest Service retained an independent engineering firm, Alternative Energy Systems Consulting, Inc. (AESC) to review the CUS report and develop reasonable alternatives for consideration in the EIS. In developing the distributed generation alternatives, the Forest Service directed AESC to consider how this type of technology could best meet the stated purpose and need for improving power reliability and service, while also alleviating regional system overloads. The three generation alternatives differ in the size and type of generators, and the degree to which they could meet the project purpose and need. These alternatives would also require other electrical and natural gas system changes, including natural gas pipeline interconnections and rebuilding portions of the 69 kV Nucla-Sunshine line to a present-day 69 kV standard. The generation alternatives include:

A Large Generator Alternative would provide power capacity that could be used for regional and local needs. A GE Frame 6B natural gas turbine generator is assumed for this analysis and would have a rated winter capacity of 33 MW *(Figure SUMMARY-3).* The generator would require a site approximately 1.5 acres in size, as well as extensions of the existing Kinder-Morgan natural gas pipeline and a compressor station near Redvale. Under this scenario, the removal of the existing 69 kV line between the Norwood and Sunshine Substations is considered technically feasible, although SMPA has indicated that they would retain the line for distribution service (Tri-State and SMPA 2000e). Among the generation scenarios,

the Large Generator Alternative would best meet the stated purpose and need set forth in Chapter 1.0 and assumes that the 13 MW of power currently provided by the Nucla-Sunshine 69 kV line would not be available in the future.

Figure SUMMARY-3
External Picture of Two Installed GE Frame 6B Gas Turbines

A Small Generator Alternative would meet the stated purpose and need for increased power reliability in southwestern Colorado and regional power transfer capability, although to a lesser degree than the proposed transmission project. The Small Generator Alternative assumes the installation of two Solar Titan 130 natural gas turbines with a combined capacity of 20 MW (***Figure SUMMARY-4*** shows a compressor station similar in size). The generators would require a site approximately 1.0 acre in size, as well as extensions of the existing Kinder-Morgan natural gas pipeline and a compressor station near Redvale. Under this scenario, the existing Nucla-Sunshine 69 kV line is assumed to remain in place and be rebuilt by SMPA over time to meet the reliability needs of its customers and financing requirements of RUS. As such, the 13 MW of power currently provided by the Nucla-Sunshine 69 kV line would continue to be available.

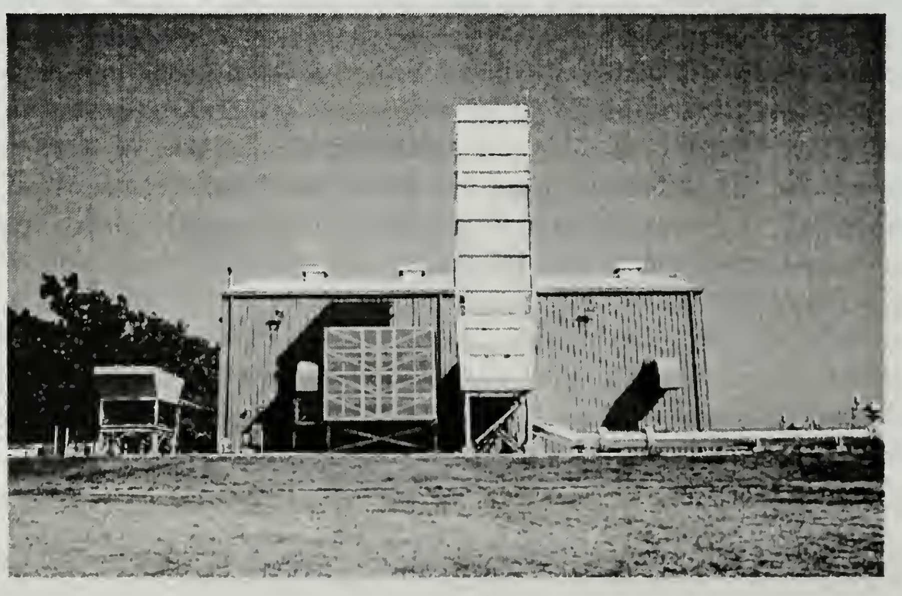


Figure SUMMARY-4
Representative Scale of a Solar Titan 130 Gas Turbine Generator

Emergency Backup Generator Alternative Under this scenario, the distributed generator would be sized and available only to provide backup power to Telluride during an emergency

outage. This scenario would not meet the other stated purposes and needs for the Project as set forth in Chapter 1.0. Similar to the Small Generator Alternative, this alternative assumes that the 13 MW of power currently available from the 69 kV line would continue to be available in the future. The Emergency Generator Alternative assumes the installation of two Solar Titan 130 natural gas turbines with a combined capacity of 20 MW ***(Figure SUMMARY-4).*** The generators would require a site approximately 1.0 acre in size, as well as extensions of the existing Kinder-Morgan natural gas pipeline and a compressor station near Redvale. Under this scenario, the existing Nucla-Sunshine 69 kV line is assumed to remain in place and be rebuilt by SMPA over time to meet the reliability needs of its customers and financing requirements of RUS.

At the direction of the Forest Service, AESC identified four feasible sites for these generator alternatives near the Telluride Substation and in Ilium Valley. ***Figure SUMMARY-5*** shows the general locale where feasible sites were identified. The purpose of this preliminary siting effort was to determine whether sites of sufficient size exist— not to identify a specific preferred site. Consequently, similar to the underground subalternative, the purpose of the EIS analysis is to provide the public a disclosure of the major environmental, cost and technical issues associated with this type of technology.

The Forest Service would not be the primary decision-making agency for this type of alternative. The permitting of a generation alternative on private land would primarily be the responsibility of San Miguel County and state agencies. It is also important to note that Tri-State has indicated they would not propose nor develop this type of energy alternative.

NO ACTION ALTERNATIVE

The No Action Alternative means that no permits would be issued on public lands by the Forest Service or other federal agencies for the Project, and no funding would be provided by the RUS. Short-term, SMPA would continue to perform routine maintenance on the existing 69 kV line and SMPA would repair and replace poles and hardware on a continuing "as-needed" basis over the next 10 to 15 years. Power reliability would continue to lessen and human health and safety risks and economic impacts associated with more frequent and longer outages would be expected to occur at some point in the future. Long-term, SMPA has stated they would still need to replace the existing 69 kV system with a present-day designed system (discussed in Section 2.3.2). Under the No Action Alternative all costs associated with the short-term incremental replacement and repair of existing poles, and the long-term replacement of the entire system with a present-day 69 kV system, would be the sole responsibility of SMPA and their 10,000 customers.

ALTERNATIVES CONSIDERED AND ELIMINATED FROM STUDY

A number of alternatives that were considered by the agencies early-on or suggested by the public during scoping were not carried forward for analysis in the EIS. The range of suggested alternatives included routing variations, alternative voltages (e.g. 69 kV rebuild) and alternative energy technologies. Routing alternatives were eliminated if the environmental and social effects of relocating the line would not avoid or substantially reduce significant impacts, or result in greater impacts than rebuilding it in its current location. As a sole alternative between Nucla and Sunshine Substations, the 69 kV voltage alternative was eliminated since the land use and visual effects would be very similar to the proposed 115 kV and this voltage line would not meet the purpose and need to the extent possible with the 115 kV system. Alternative technology options considered and eliminated included hydroelectric, solar and wind. These technologies were eliminated due to a number of cost, environmental and technology development factors. Chapter 2.0 of the EIS discusses the rationale for eliminating various alternatives suggested during scoping.

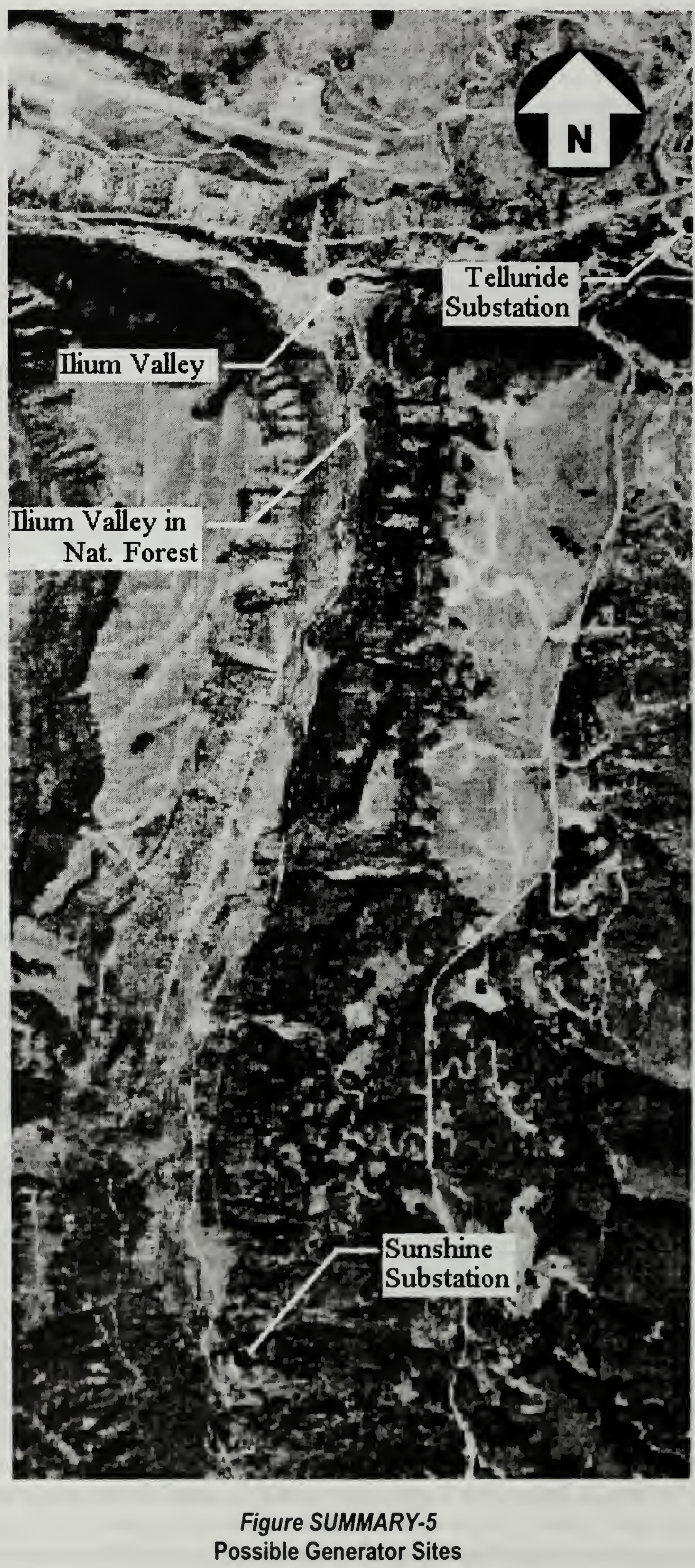


Figure SUMMARY-5
Possible Generator Sites

SUMMARY OF FINDINGS

The summary of findings is organized in the following three sections:

- Comparison of Overhead Transmission Alternatives
- Comparison of Overhead and Underground Transmission Technologies
- Comparison of Transmission and DG Alternatives

COMPARISON OF OVERHEAD TRANSMISSION ALTERNATIVES

The major issues of the transmission alternatives are summarized below according to routing options between the Nucla and Norwood Substations, and routing alternatives between Norwood and either the Sunshine or Telluride Substations. In general, the summary discussions focus on long-term visual and land use-related impacts. Impacts to the natural, biological, and cultural environments would be short-term and/or substantially mitigated or avoided through Environmental Protection Measures (EPMs) proposed by Tri-State or required by federal agencies.

Supporting the narrative are *Tables S-1* and *S-2* at the back of this section. The summary tables address the type and magnitude of effects the transmission alternatives would have on the following environmental and social topics: air quality, geologic conditions and paleontological resources, soils, water resources, biological resources, cultural resources, existing and planned land uses, recreation, socioeconomics and property values, traffic and transportation, noise, and human health and safety.

These tables compare impacts according to the qualitative criteria and quantitative measurements reported in the EIS. Impacts have been documented qualitatively according to three impact levels: high, moderate and low. These qualitative levels are defined for each of the resource topics in FEIS Volume I, Chapter 3.0 and are used to reflect professional judgments regarding the severity of effects that each alternative would cause. Quantitative impact findings are based upon the natural, social and cultural resources encountered along each corridor alignment or centerline. The alignments, or centerlines, are hypothetical right-of-way locations for the Project within each corridor. These alignments represent likely locations for the Project based upon Tri-State's preliminary engineering and right-of-way studies. These alignments have been used in the EIS for analysis and comparison of alternatives. Each alignment section is identified with a 'link' number for ease of locational referencing. For purposes of the EIS analysis, the impact assessment assumes a 100-foot-wide right-of-way in all instances.

Impacts shown on *Tables S-1* and *S-2* represent 'worst-case' effects before mitigation measures are applied. Applicant committed Environmental Protection Measures (EPMs) are assumed as presented in the FEIS Volume I, Chapter 2.0, *Tables 2.2-4* and *2.2-5*. Potential measures that would further reduce environmental effects are provided in Chapter 3.0 by resource topic. Mitigation measures presented in Chapter 3.0 are potential measures only, and do not represent commitments on the part of the applicants, or federal lead and cooperating agencies. The degree to which these measures may be adopted for the Project will be determined by the Forest Service, BLM and RUS in their respective Records of Decision (RODs), and by Montrose and San Miguel Counties through their respective Special Use Permit application processes. The residual effects summarized below reflect the types and degrees of impacts that would remain after potential mitigation measures are applied to the various alternatives.

It should be noted that Tri-State has not identified any final rights-of-way and, as such, the project's final location within the corridors may vary from the alignments considered in

this EIS. Assumptions used in estimating quantified effects of the alternatives are contained in FEIS Volume I, Chapter 2.0.

MAJOR ISSUES ASSOCIATED WITH NUCLA-NORWOOD ALTERNATIVES

The routing alternatives between the Nucla and Norwood Substations would cross portions of Montrose and San Miguel Counties and affect both privately-owned and public lands administered by the Bureau of Land Management. *Figure SUMMARY-1* shows the general vicinity of these alternatives. Reference should be made to the FEIS Volume II, *Plate PROJECT-2* for detailed locations and link identifications.

IMPACTS COMMON TO ALL ALTERNATIVES

The EIS concludes that the following types of impacts would occur, regardless of the alternative selected:

- The Norwood Substation would be expanded or relocated. Visual and land use impacts would occur to residents of Norwood. During construction, increased traffic, noise and dust would occur from construction activities, equipment and vehicles.
- The proposed transmission line would require a right-of-way 75 to 100 feet in width that would restrict public and private land use options within the right-of-way.
- Residents of Montrose and San Miguel Counties would be affected visually by the increased height of the proposed 115 kV poles (average height 70 feet), compared to the existing 69 kV line (average height 35 to 40 feet). Increased visibility of the conductors would occur as well due to the pole height increase.
- All the alternatives would result in short-term land disturbances during construction. Construction equipment and activities would increase noise, dust and traffic during the construction period. Disturbances to soils, vegetation communities and wildlife habitat, wetlands and water resources would also occur.

NUCLA-NORWOOD NORTHERN ALTERNATIVE

The Nucla-Norwood Northern Alternative (Links 0, 1 and 3) would be the shortest route – 16.5 miles. This alternative would entail replacing the existing 69 kV line with a new 115 kV line in the same location. Tri-State would use existing roads and overland construction methods. The vast majority of the existing 69 kV line crosses portions of Montrose and San Miguel Counties that are used for agricultural, grazing and rural lifestyle purposes. The most developed areas crossed by the Northern Alternative are through the community of Redvale and the Norwood Gardens Subdivision. Minor reroutes would likely be required in these areas and others, where adequate right-of-way clearances necessary for a 115 kV line do not presently exist. Total ground disturbance from construction is estimated to be 209.9 acres. Single poles would be used for the vast majority of this route.

Land Use and Private Landowner Conflicts Areas where existing land uses and structures are incompatible with right-of-way clearance requirements for 115 kV lines include the town of Redvale, the Norwood Gardens Subdivision and scattered rural residential areas of San Miguel County near the Norwood Substation. The existing 69 kV line also crosses and bisects numerous private lands that are used for ranching and agricultural related uses. The line crosses approximately 4 miles of prime farmland. Approximately 21 homes and 34 lots are within 300 feet of the alignment. Existing uses and future land use development options could be affected, depending upon individual landowner and easement conditions. Land use conflicts are considered long-term and adverse. Right-of-way adjustments could avoid most, if not all, direct conflicts with the utility easement restrictions.

Visual Impacts The increased height of the 115 kV poles would be noticeably visible within the open agricultural valleys and from a number of rural residential settings. Visual impacts are considered adverse, but not significant, since the visual character of the built landscape has features of similar scale and line, such as other utility poles, fences, and agricultural structures. Visual impacts in natural settings would be greater due to the lack of similar land use developments. Approximately 166 residences are within a foreground viewing distance zone (0.5 mile from the corridor centerline). This alternative would also have long-term impacts on the quality of views seen from the Unaweep-Tabeguache Scenic Byway (SR 141) for 17 miles.

Natural and Biological Environmental Issues - Geology, Slope Stability, Wetlands, and Sensitive Wildlife Issues that would need to be addressed in engineering design and construction include avoidance of steep slopes and areas of slope instability, numerous wetland and water resources, and sensitive habitats and breeding periods for riparian dependent wildlife species, southwestern willow flycatcher and bald eagles. With careful design and pole placements, most, if not all, natural resource constraints could be avoided or substantially minimized.

Nucla-Norwood Central Alternative

The Nucla-Norwood Central Alternative (Links 0, 2, 3, 4 and 5) would be 19.5 miles long. The alternative would entail crossing BLM lands for 4.2 miles, mainly south of the Nucla Substation, before turning eastward and paralleling the Montrose/San Miguel County line for 9.7 miles. The alternative crosses Naturita Canyon (Link 5.0, mile markers 4.6 to 5.1) and parallels the north rim of Naturita Canyon for approximately 3.5 miles along the county line and at the edge of rural developments. The Central Alternative would avoid the community of Redvale, but would cross the Norwood Gardens Subdivision, northwest of Norwood. Tri-State would use and improve existing roads for construction access. Helicopter construction would be used at the Naturita Canyon crossing. This alternative would affect both developed agriculture and grazing lands, as well as natural landscapes supporting pinyon-juniper vegetation. With the Central Alternative, the existing 69 kV line would be removed or converted to a distribution line. Total ground disturbance from construction is estimated to be 193 acres. Pole types would include H-frame, single pole, and three-pole structures.

Land Use and Private Landowner Conflicts Areas where existing land uses and structures are incompatible with right-of-way clearance requirements for 115 kV lines include the Norwood Gardens Subdivision and scattered rural residential areas of San Miguel County near the Norwood Substation. The existing 69 kV line also crosses and bisects numerous private lands that are used for ranching and agricultural related uses, including 1.0 mile of prime farmland. Approximately 5 homes and 16 lots are within 300 feet of the alignment. Existing uses and future land use development options could be affected, depending upon individual landowner and easement conditions. Land use conflicts are considered long-term and adverse. Right-of-way adjustments avoid most, if not all, physical conflicts with utility easement restrictions.

Visual Impacts The increased height of the 115 kV poles would be noticeably visible within the open agricultural valleys, from a number of rural residential settings, and as seen along the north rim of Naturita Canyon. Visual impacts are considered adverse, but not significant, since the visual character of the built landscape has features of similar scale and line, including utility poles, fences, and agricultural structures. Visual impacts in natural settings would be greater due to the lack of similar land use developments. Approximately 101 residences are within a foreground viewing distance zone (0.5 mile from the corridor centerline). This alternative would also have long-term impacts on the quality of views seen from the Unaweep-Tabeguache Scenic Byway (SR 141) for 6.5 miles.

Natural and Biological Environmental Issues – Geology, Slope Stability, Wetlands, and Sensitive Wildlife Issues that would need to be addressed in engineering design and construction include avoidance of steep slopes and areas of slope instability, numerous wetland and water resources, and sensitive habitats and breeding periods for riparian dependent wildlife species, southwestern willow flycatcher and bald eagles, among others. With careful design and pole placements, most natural resource constraints could be avoided or substantially minimized.

NUCLA-NORWOOD SOUTHERN ALTERNATIVE

The Nucla-Norwood Southern Alternative (Links 0, 4, 6, 7 and 8) would be 18.2 miles long. The alternative would entail crossing BLM lands for 8.5 miles and private lands for 9.7 miles. This alternative maximizes the use of public BLM lands and would enlarge seismic exploration lines (approximately 5 feet wide) to 14 feet wide for access roads along much of the alternative. Helicopter construction would be used at the crossing of Naturita Canyon (Link 6, mile markers 8.2 to 9.0). The Southern Alternative would avoid the community of Redvale and Norwood Gardens Subdivision. This alternative would primarily affect undeveloped public lands supporting pinyon-juniper vegetation. Rural agricultural areas would also be affected west of the Norwood Substation. Similar to the Central Alternative, the existing 69 kV line would be removed or converted to a distribution line. Total ground disturbance from construction is estimated to be 203.3 acres. Poles would primarily be H-frame on public lands and single poles on private lands.

Land Use and Private Landowner Conflicts The Nucla-Norwood Southern Alternative would affect public lands with dispersed recreational values and private rural residential and agricultural lands west of the Norwood Substation. This alternative crosses a central section of Naturita Canyon that is in a natural undeveloped state and is valued by local residents for open space and a variety of dispersed and passive recreational pursuits. Approximately 5 homes and 2 undeveloped lots are within 300 feet of the alignment. Existing uses and future land use development options could be affected, depending upon individual landowner and easement conditions. Land use conflicts are considered long-term and adverse. Right-of-way adjustments could avoid most, if not all, physical conflicts with utility easement restrictions.

Visual Impacts Visual impacts to Naturita Canyon would be high due to the degree of landscape character change that the 70-foot tall poles, conductors and marker balls would create. Long views of the conductor spans and marker balls would occur impacting the natural setting of the canyon. Visual impacts in most other agricultural and rural residential areas are considered adverse, since the visual character of the built landscape has features of similar scale and line, such as other utility poles, fences, and agricultural structures. Approximately 45 residences are within a foreground viewing distance zone (0.5 mile from the corridor centerline).

Natural and Biological Environmental Issues – Geology, Slope Stability, Wetlands, and Sensitive Wildlife Issues associated with the Southern Alternative include potential direct impacts to riparian dependent wildlife species and bald eagles. Indirect impacts to sensitive wildlife species could result from increased access into currently remote public lands, as well as construction-related disturbances. Geotechnical issues include construction on steep slopes and areas of slope instability, avoidance of wetlands and water resources. With careful pole placements, most impacts to natural resources could be minimized or avoided.

NUCLA-NORWOOD SUBALTERNATIVES

Subalternative A is a routing variation across Naturita Canyon that could be used instead of the canyon crossing evaluated in the Southern Alternative. Subalternative A would route the 115 kV line down into the canyon, rather than spanning the canyon rim to rim. This

subalternative was evaluated in response to public concerns regarding potential impacts to the natural qualities of the canyon that the 115 kV poles, conductors and marker balls would create. Subalternative A would avoid the strong visual contrasts created by the conductors and marker balls, however, the conductors would still be highly visible under certain lighting conditions. This subalternative would also have the potential to impact natural qualities in the canyon, including riparian vegetation and sensitive wildlife species.

Norwood Substation Alternative Site B would consist of constructing a new and larger, approximately 2-acre, substation southeast of the existing Norwood Substation. With this subalternative, the existing Norwood Substation would be dismantled and restored to a natural setting. This subalternative would reduce the visual effects of expanding the substation at its current location, near the town of Norwood. The subalternative would also reduce potential land use conflicts that are associated with multiple lines connecting to the substation facility.

MAJOR ISSUES ASSOCIATED WITH NORWOOD-TELLURIDE AND NORWOOD-SUNSHINE ALTERNATIVES

The routing alternatives between the Norwood and Telluride or Sunshine Substations would cross portions of San Miguel County and affect both privately-owned and public lands administered by the BLM and the Forest Service. These two routing alternatives are the same for the first 16.6 miles (Links 9, 10, 11, 12 and 13) and follow the existing 69 kV line location. The Norwood-Sunshine line would continue to follow the existing 69 kV alignment across portions of Wilson Mesa, Sunshine Mesa and Ilium Valley to the Sunshine Substation. In comparison, the Norwood-Telluride Alternative would establish a new utility corridor along portions of the south rim of the San Miguel River Canyon and terminate at the Telluride Substation. This alignment utilizes public lands administered by the BLM and Forest Service to the extent feasible.

IMPACTS COMMON TO BOTH ALTERNATIVES

The environmental impacts of these two routing options would be identical for the first 16.6 miles where these alignments are the same. This includes the short-term construction and long-term operational impacts of the Project extending eastward from the Norwood Substation across portions of Wrights Mesa, Beaver Creek, Beaver Mesa, Specie Creek and Specie Mesa.

Common impacts of these alternatives would consist of the following:

- The proposed transmission line would require a right-of-way 75 to 100 feet in width that would restrict public and private land use options within the right-of-way. Residential areas on Wrights Mesa that would be directly affected include the Fitts Subdivision, east of the Norwood Substation. The proposed line would be underbuilt with distribution service through this residential area.

- Private lands used primarily for ranching, residential or recreational uses would be directly impacted by the project right-of-way on Beaver Mesa and Specie Mesa, including lands within the Peninsula, Specie Mesa Ranch and Top of the World Subdivision. Impacts to land values could occur in instances where the Project interferes with scenic views to the San Juan Mountains.

- Residents and visitors of San Miguel County would be affected visually by the increased height of the proposed 115 kV poles (average height 70 feet), compared to the existing 69 kV line (average height 35 to 40 feet). Increased visibility of the conductors would occur as well due to the pole height increase. Subdivisions with

scenic views to the San Juan Mountains would be affected, including views from Specie Mesa Ranch, Top of the World Subdivision, and the Peninsula.

- Both alternatives would result in short-term land disturbances during construction. Construction equipment and activities would increase noise, dust and traffic for the short period of construction.
- Both alternatives would cross the San Miguel River Canyon Area of Critical Environmental Concern (ACEC). The crossing of the ACEC would occur along the existing 69 kV utility corridor and would be in compliance with the BLM's management plan.

Norwood-Sunshine Alternative

The Norwood-Sunshine Alternative (Links 9, 10, 11, 12, 13, 14, and 15) is 28.3 miles long, crossing private lands in San Miguel County for 25.5 miles, Colorado State lands for 0.6 mile, BLM public lands for 1.1 miles and National Forest lands for 1.1 miles. This alternative would entail rebuilding the existing 69 kV line to 115 kV in its current location. Construction practices would include using or improving existing roads, employing overland construction techniques and vehicles in areas of low vegetation cover, and using helicopter construction methods at canyon and river crossings. Total ground disturbance from construction is estimated to be 174 acres. Structures would primarily consist of single poles on private lands and H-frame wood structures on public lands.

Land Use and Private Landowner Conflicts Rebuilding the existing 69 kV line to 115 kV would cause increased impacts to private lands due to the wider right-of-way that would be required. In addition to the impacts common to both alternatives, this alternative would cross private lands on Wilson and Sunshine Mesa, and directly impact private ranches and lots within the Wilson Mesa Subdivision, and Ptarmigan Ranch. In total, approximately 10 homes are within 300 feet of the alignment, as well as a number of undeveloped lots on Specie, Wilson and Sunshine Mesas. Existing uses and future land use development options could be affected, depending upon individual landowner and easement conditions. Land use conflicts are considered long-term and adverse. Due to the scenic values associated with private lands on these mesas, this alternative has the potential to impact land values in instances where the proposed 115 kV line would directly conflict with scenic views.

Visual Impacts The Norwood-Sunshine Alternative would primarily impact scenic views from private homes and lots on Specie, Wilson and Sunshine Mesas. Developed agricultural settings on Wrights Mesa could also be adversely affected. Approximately 92 residences are within a foreground viewing distance (0.5-mile) of the alignment. The Faraway Ranch private recreation area would also be visually affected by this alternative. Significant visual impacts to residential settings and areas used for dispersed recreation could also occur up to 2 plus miles from the alignment due to the increased size and scale of the 115 kV transmission line. Visual impacts would vary depending upon specific viewing conditions to the San Juan Mountains and the degree to which the powerline would interfere with those views. The increased height of the proposed 115 kV poles combined with the increased visibility of the elevated conductors could result in increased visual contrasts with the natural setting and scenic views to the San Juan Mountains. Long-term visual impacts are assessed as high to moderate, depending on individual setting conditions.

Natural and Biological Environmental Issues – Geology, Slope Stability, Wetlands, and Sensitive Wildlife Issues associated with the Norwood-Sunshine Alternative include potential direct impacts to Mexican spotted owl habitat, as well as indirect impacts to habitats suitable for Gunnison sage grouse, southwestern willow flycatcher, and riparian dependent wildlife species.

Geotechnical issues include construction on steep slopes and areas of slope instability, avoidance of wetlands and water resources. With careful pole placements, most impacts to natural resources could be minimized or avoided.

Norwood-Telluride Alternative

The Norwood-Telluride Alternative (Links 9, 10, 11, 12, 13, 19, 20 and 21) is 29.5 miles long. In addition to the impacts common to both alternatives, the Norwood-Telluride Alternative would impact private and public lands along the south rim of the San Miguel River Canyon. Construction techniques would employ ground crews and equipment in areas where access exists or where overland construction techniques and vehicles are feasible. Along the south rim of the San Miguel River Canyon, ground crews, ATV's and helicopter construction methods would be used. Total ground disturbance from construction is estimated to be 262 acres. Structure designs would primarily be single wood poles on private lands and a combination of single, H-frame and three-pole structures on public lands and steep slopes.

Land Use and Public/Private Land Management Conflicts. In addition to the impacts common to both alternatives, potential impacts from the Norwood-Telluride Alternative include direct physical impacts to the San Miguel River Canyon Special Recreation Management Area, direct physical impacts to the Galloping Goose Recreational Trail and potential direct conflicts with platted lots in the Ilium Valley Business and Industrial Park. This alternative also has the potential to impact private lands and development options due to the greater right-of-way required for the 115 kV Project. Approximately 9 residences as well as numerous undeveloped lots are within 300 feet of the alignment,

Visual Impacts The Norwood-Telluride Alternative would impact both public and private views and landscapes of high scenic quality. This alternative would impact the quality of views afforded from SR 145, the San Juan Skyway National Scenic Byway, for approximately five miles of roadway. Roadside views to the San Miguel River Canyon would be adversely affected by the visibility of poles, conductors, and right-of-way clearings through conifers and aspens on the south slopes of the canyon. The right-of-way clearing would also be visible from the Telluride Ski Area, the Last Dollar Road, County Road P.58, the Telluride Airport and residents of Aldasoro and Greyhead Ranches. In total, there are approximately 81 residences within a foreground viewing distance zone from the Project (approximately 0.5-mile). Significant visual impacts to residential settings and areas used for recreation could also occur up to 4 plus miles from the alignment, depending upon specific viewing conditions. The increased height of the proposed 115 kV poles combined with the increased visibility of the elevated conductors could result in strong visual contrasts with the natural setting and impact scenic views to the San Miguel River Canyon. Long-term visual impacts are assessed as high to moderate, depending on individual setting conditions. Views from a residential subdivision east of the South Fork Road, near the Ilium Valley Business and Industrial Park would also be adversely affected, as well as views from the Mary E. Day Use Area and Galloping Goose Trail.

Natural and Biological Environmental Issues – Geology, Slope Stability, Wetlands, and Sensitive Wildlife Biological issues associated with the Norwood-Telluride Alternative include potential direct impacts to Mexican spotted owl habitat, as well as indirect impacts to habitats suitable for Gunnison sage grouse, Canadian lynx, southwestern willow flycatcher, and riparian dependent wildlife species. With careful construction practices including helicopter placement of poles and timing of construction to avoid sensitive biological species breeding periods, most impacts to sensitive wildlife and riparian species could be reduced to less than significant levels.

Geotechnical and soils issues include construction on steep slopes and areas of slope

instability, and potential impacts to wetlands and water resources, especially along the San Miguel River. This alternative poses significant slope stability risks and hazards from installing poles on steep mountain slopes. Special construction techniques for pole placements would be required to avoid most impacts. The location of the line on the canyon slopes, where no winter access would be possible in the event of an outage, also represents an unmitigable hazard and power reliability risk.

NORWOOD-TELLURIDE/SUNSHINE OVERHEAD SUBALTERNATIVES

Subalternatives B and C are common to both the Norwood-Sunshine/Telluride Alternatives and are routing options around the Fitts Subdivision. Between these two options, Alternative C would minimize visual impacts to residents of the subdivision; however, other residents on larger rural parcels would be visually affected.

Subalternative D is also common to both primary routing alternatives. This minor routing adjustment would avoid impacts of bisecting agricultural lands by following field boundaries.

Subalternative E pertains to the Norwood-Telluride Alternative. This subalternative would avoid the visual impacts of crossing the National Scenic Byway twice near Ilium. Instead, Subalternative E would stay south of the San Miguel River. While visual impacts to the San Juan Skyway National Scenic Byway would be significantly reduced in this area, sensitive biological habitats and wetlands could be directly impacted instead.

Table S-1
Summary of Impact Findings - Nucla-Norwood Primary System Alternatives

Evaluation Factors	Nucla-Norwood Alternatives		
	Northern	**Central**	**Southern**
Summary of Project Characteristics			
PROJECT CHARACTERISTICS:			
Length of Line:	16.5 miles	19.5 miles	18.2 miles
Jurisdiction – By Public and Private			
- Public BLM	*1.5 miles*	*4.2 miles*	*8.5 miles*
- U.S. Forest Service	*None*	*None*	*None*
- State of Colorado	*None*	*None*	*None*
- Private	*15.0 miles*	*15.3 miles*	*9.7 miles*
Jurisdiction – By County			
- Montrose County	*12.6 miles*	*15.7 miles*	*7.4 miles*
- San Miguel County	*3.9 miles*	*3.8 miles*	*10.8 miles*
Approximate No. of Poles by Type			
- Single Poles	*175*	*85*	*105*
- H-frame and 3-Pole Structures	*15*	*85*	*30*
Total No. of Pole Structures	*190*	*170*	*135*
Estimated Amount of Ground Distrubance	*209.9 acres*	*193.1 acres*	*203.3 acres*
Climate and Air Quality (EIS Section 3.2)			
Impact Findings: 115 kV Line, Substations and Distribution Lines –	*Moderate*	*Low to Moderate*	*Low to Moderate*
Summary:	Short-term impacts on air quality may result from construction equipment and vehicles due to the increased fugitive dust, hydrocarbons, carbon monoxide and nitrogen dioxide. Impacts would be greatest along the Northern Alternative and at the Norwood Substation where a number of residences are nearby. Impacts would also occur where access roads would be improved for the Central and Southern Alternatives. No high impacts would occur since effects would be short-term and no violation of air quality standards would result.		
Geology, Paleontology and Mineral Resources (EIS Section 3.3)			
Impact Findings: 115 kV Line –	***High - 4.7 miles*** *Moderate - 6.8 miles*	***High - 9.3 miles*** *Moderate - 2.5 miles*	***High - 5.3 miles*** *Moderate - 2.2 miles*

Table S-1
Summary of Impact Findings - Nucla-Norwood Primary System Alternatives

Evaluation Factors	Nucla-Norwood Alternatives		
	Northern	Central	Southern
Summary:	High impacts, associated with geologic hazards (such as slope instability and rockfalls at canyon crossings), could occur where the transmission line would cross very steep slopes (50% and greater). Moderate impacts would likely occur in areas of steep slopes (between 30 and 49%). Potential moderate impacts are also identified in areas where the line would cross geologic formations potentially yielding fossils of scientific value. Such formations include the Morrison, Cutler and Dolores. High impacts may also occur where the line crosses near known mining activity. An additional 0.7 mile of high impact would also result from dismantling the 69kV line for the Central and Southern Alternatives. All impacts are mitigable to low or no identifiable effect.		
Soils (EIS Section 3.4)			
Impact Findings: 115 kV Line –	***High - 0.7 mile*** *Moderate - 1.4 miles*	***High - 1.1 miles*** *Moderate - 0 mile*	***High - 0 mile*** *Moderate - 0 mile*
Summary:	High impacts could occur where the project would cross very steep slopes with high erosion potential. Moderate effects are identified in high erosion potential soils characterized by steep slopes. With implementation of potential mitigation measures, all impacts are mitigable to low levels or no identifiable effect.		
Water Resources (EIS Section 3.5)			
Impact Findings: – 115 kV Line	***High - 3*** *Moderate – 48*	***High - 9*** *Moderate - 31*	***High - 9*** *Moderate - 25*
Summary:	Impacts to water resources could occur if project-related disturbances resulted in increased sedimentation and degradation of water quality. Impacts listed above reflect numbers of crossings of water resource areas. High impacts could occur where the line would cross wetlands, water bodies, major streams with riparian values and major drainages where improved access is proposed. Moderate impacts are indicated where the project could have direct or indirect effects to adjacent wetlands, major drainages, minor drainages with riparian values and minor drainages where improved access is proposed. With potential mitigation measures, high impacts could be avoided through careful pole placement or other means. It is anticipated that all impacts to water resources are mitigable to low or moderate levels.		
Biological Resources (EIS Section 3.6)			
Impact Findings: – 115 kV Line	***Potential Impacts to Sensitive Wildlife*** ***Moderate –*** - Direct and indirect impacts to 1 riparian stream crossing and 6 non-riparian stream crossings	***Potential Impacts to Sensitive Wildlife*** ***Moderate –*** - Direct and indirect impacts to 3 riparian stream crossing and 12 non-riparian stream crossings - Potential impacts to riparian dependent sensitive wildlife – disturbance and mortality potential at 1 riparian stream crossing and 4 non-riparian stream crossings	***Potential Impacts to Sensitive Wildlife*** ***Moderate –*** - Direct and indirect impacts to 4 riparian stream crossing and 19 non-riparian stream crossings - Potential impacts to riparian dependent sensitive wildlife – disturbance and mortality potential at 1 riparian stream crossing and 6 non-riparian stream crossings
Substations –	All impacts in the low to no identifiable impact range.	All impacts in the low to no identifiable impact range.	All impacts in the low to no identifiable impact range.

Table S-1
Summary of Impact Findings - Nucla-Norwood Primary System Alternatives

Evaluation Factors	Nucla-Norwood Alternatives		
	Northern	**Central**	**Southern**
Removal of 69 kV Line and Other Distribution Changes –	All impacts in the low to no identifiable impact range.	All impacts in the low to no identifiable impact range.	All impacts in the low to no identifiable impact range.
Summary:	With implementation of the EPMs that have been committed to by Tri-State, and would be required by the Forest Service and BLM on public lands, impacts to vegetation communities, including riparian habitats, should be low. Similarly, many impacts to special status wildlife would also be minimized to low or moderate levels through implementation of the EPMs including potential mortalities to bald eagles and other raptors due to collisions with or electrocutions from the powerlines. Potentially high impacts have been identified where the project may result in indirect impacts to Mexican spotted owls, due to suitable habitat within one mile of the ROW, and to southwestern willow flycatchers, due to suitable habitat within 0.25 mile of the alignment. High impacts to Gunnison sage grouse also reflect potential indirect impacts due to disturbances to suitable habitat within one mile of the alignment. Moderate impacts have been identified for potential direct and indirect impacts to bald eagle day roost sites and to important winter ranges for elk and mule deer.		
Cultural Resources (EIS Section 3.7)			
Impact Findings: 115 kV Line and Substations –	***High Impact Potential –*** – 155.1 acres ***Moderate Impact Potential –*** – 4867.7 acres	***High Impact Potential –*** - 329.2 acres ***Moderate Impact Potential –*** - 4062.6 acres	***High Impact Potential –*** - 504.5 acres ***Moderate Impact Potential –*** - 3815.7 acres
Removal of 69 kV Line and Other Distribution Changes –	***High or Moderate Impact Potential –*** – 0 acres	***Moderate Impact Potential –*** – 139.2 acres	***Moderate Impact Potential –*** – 190.4 acres
Summary:	Potential impacts to cultural resources are based upon the cultural resource sensitivity of the landscapes and the degree of disturbance that project-related access would cause. Within the project area, high sensitivity areas include areas within one mile of canyon rims with permanent water, overhangs and ridge tops, areas of pinyon/juniper on the edges of sagebrush, and historical mining and agricultural settlements. Impacts shown reflect the potential sensitivity of lands within the alternative corridors. Impacts to cultural resources would be mitigable to low levels through implementation of the EPMs, including conducting 100% surveys of the final alignment, access roads and pole sites.		
Land Use (EIS Section 3.8)			
Potential Jurisdictions Affected: **115 kV Line –**	Forest Service: none BLM: 1.5 miles State of Colorado: none Montrose County private lands -11.1 miles San Miguel County private lands - 3.9 miles	Forest Service: none BLM: 4.2 miles State of Colorado: none Montrose County private lands - 11.5 miles San Miguel County private lands - 3.8 miles	Forest Service: none BLM: 8.5 miles State of Colorado: none Montrose County private lands - 3.4 miles San Miguel County private lands - 6.3 miles
Substations –	San Miguel County - 2 acres	San Miguel County - 2 acres	San Miguel County - 2 acres
69 kV Line Removal and Other Distribution Changes –	None	BLM: 1.5 miles Montrose County private lands - 9.2 miles	BLM: 1.5 miles Montrose County private lands - 9.9 miles San Miguel County private lands - 3.9 miles

Table S-1
Summary of Impact Findings - Nucla-Norwood Primary System Alternatives

Evaluation Factors	Nucla-Norwood Alternatives		
	Northern	**Central**	**Southern**
Impact Findings: 115 kV Line, Substations, Removal of 69 kV line and Distribution Changes –	***Existing Land Uses:*** ***High -*** – Community of Redvale – Irrigated Agriculture - 3.8 miles – Prime farmlands – 4.0 miles – Potential direct impacts to residential structures within ROW: 4 ***Moderate –*** – Irrigated Agriculture boundaries - 3.3 miles – Indirect impacts to non-residential structures: 3 – Indirect impacts to residences within 300 feet of alignment: 21 – Indirect impacts to residences within 0.5 mile of alignment: 145 – Direct and indirect impacts to 2 subdivisions:Norwood Gardens Subdivision and Timberline View Subdivision	***Existing Land Uses:*** ***High -*** – Irrigated Agriculture - 0.8 mile – Prime farmlands - 1.0 mile – Potential direct impacts to residential structures within ROW: 3 ***Moderate –*** – Irrigated Agriculture boundaries - 2.4 miles – Indirect impacts to residences within 300 feet of alignment: 5 – Indirect impacts to residences within 0.5 mile of the alignment: 96 – Direct and indirect impacts to 2 subdivisions *Beneficial Effects –* – Community of Redvale and other residential and agricultural areas currently affected by the 69 kV line. Removal of line would eliminate any ongoing land use impacts.	***Existing Land Uses:*** ***High -*** – Irrigated Agriculture - 0.3 mile ***Moderate –*** – Indirect impacts to residences within 300 feet of alignment: 5 – Indirect impacts to residences within 0.5 mile of alignment: 40 –Indirect impacts to 1 subdivision: La Mesa Subdivision *Beneficial Effects –* – Community of Redvale and other residential and agricultural areas currently affected by the 69 kV line. Removal of line would eliminate any ongoing land use impacts.
Land Use (EIS Section 3.8) ***Impact Findings: 115 kV Line, Substations, Removal of 69 kV line and Distribution Changes –*** ***continued***	***Planned Land Uses:*** ***High –*** San Miguel County Priority Class Lands Affected – – irrigated farmlands and meadows: 2.5 miles; – skylines visible from SH 145: see section 3.10 visual resources summary – impacts to natural streams and ponds: see section 3.5 water resources summary; – geologic hazard areas: see section 3.3 summary – impacts to critical wildlife areas: see section 3.6 biology summary – impacts to significant cultural resources: see section 3.7 summary ***Moderate –*** BLM Wildlife Management Emphasis Areas Crossed	***Planned Land Uses:*** ***High –*** San Miguel County Priority Class Lands Affected – – irrigated farmlands and meadows: 2.5 miles; – impacts to natural streams and ponds: see section 3.5 water resources summary; – geologic hazard areas: see section 3.3 summary – impacts to critical wildlife areas: see section 3.6 biology summary – impacts to significant cultural resources: see section 3.7 summary ***Moderate –*** – skylines visible from SH 145: see section 3.10, visual resources summary	***Planned Land Uses:*** ***High –*** San Miguel County Priority Class Lands Affected – – irrigated farmlands and meadows: 0.3 miles; – impacts to natural streams and ponds: see section 3.5 water resources summary; – geologic hazard areas: see section 3.3 summary – impacts to critical wildlife areas: see section 3.6 biology summary – impacts to significant cultural resources: see section 3.7 summary ***Moderate –*** – skylines visible from SH 145: see section 3.10, visual resources summary

Table S-1
Summary of Impact Findings - Nucla-Norwood Primary System Alternatives

Evaluation Factors	Nucla-Norwood Alternatives		
	Northern	**Central**	**Southern**
Summary:	Potential impacts addressed in this section include direct and indirect effects to existing residential, commercial, industrial and agricultural land uses and conformity with adopted plans of the Forest Service, BLM and Counties. High impacts are identified in instances where direct conflicts with existing land uses, that are socially and economically important, could result. Moderate effects are identified where indirect effects to existing land uses would occur during the short-term construction phase. Impacts to existing land uses are considered to be mitigable to low or moderate levels through careful pole placement and final ROW planning and design. Potential effects to San Miguel County reflect the degree to which the project would affect lands identified in the Comprehensive Development Plan (CDP, 1999) as Priority Class 2 or 3 lands that should be avoided in siting power lines. No priority class I lands would be affected.		
Recreation (EIS Section 3.9)			
Impact Findings: 115 kV Line, Substations, 69 kV Line Removal and Other Distribution Changes –	***High Impacts: 0*** *Moderate Impacts:* scenic driving along Unaweep-Tabeguache Scenic Byway (see 3.10 visual resources summary)	***High Impacts: 0*** *Low to Moderate Impacts*: hunting and dispersed recreation use along Naturita Canyon and rim	***High Impacts: 0*** *Moderate Impacts:* hunting and dispersed recreational use in Naturita Canyon
Summary:	Potential impacts to quality of recreational experiences would primarily occur during project construction when equipment, vehicles, and construction activities would cause short-term noise, dust and visual impacts. Dispersed recreational activities in Naturita Canyon and on BLM lands would primarily be affected, as well as private hunting areas.		
Visual Resources (EIS Section 3.10)			
Impact Findings: 115 kV Line –	Landscape Impacts - - *Moderate* to Low BLM VRM Classes Affected - - VRM Class III 1.5 miles Scenic Highway Views - - *Moderate*: 17 highway miles Residential Views - - *Moderate to **High***: 166 residences within foreground viewing distance	Landscape Impacts - - *Moderate* to ***High*** – Naturita Crossing - *Moderate* to Low elsewhere BLM VRM Classes Affected - - VRM Class III 4.2 miles Scenic Highway Views - - *Moderate:* 6.5 highway miles Residential Views - - *Moderate to **High***: 101 residences within foreground viewing distance	Landscape Impacts - - ***High*** - Naturita Canyon crossing - *Moderate* to Low elsewhere BLM VRM Classes Affected - - VRM Class III 8.5 miles Scenic Highway Views - - Low: 0.6 highway mile Residential Views - - ***High***: 18 (approx.) within foreground and middleground viewing distance - *Moderate to **High***: 45 within foreground viewing distance
Substations –	Norwood Substation - Moderate Oakhill Substation removal - Beneficial (slightly)	Norwood Substation - Moderate Oakhill Substation removal - Beneficial (slightly)	Norwood Substation - Moderate Oakhill Substation removal - Beneficial (slightly)

Table S-1
Summary of Impact Findings - Nucla-Norwood Primary System Alternatives

Evaluation Factors	Nucla-Norwood Alternatives		
	Northern	**Central**	**Southern**
Removal of 69 kV line and Other Distribution Changes –	*Moderate to* ***High*** *-* – Community of Redvale	*Beneficial -* – Community of Redvale	*Beneficial -* – Community of Redvale
	Views from Dispersed Recreation Areas - - Low	Views from Dispersed Recreation Areas - - Low	Views from Dispersed Recreation Areas - - *Moderate*
Summary:	Visual impacts would be long-term and would result from the introduction of facilities into landscapes and views that are considered sensitive by the public or land management agencies. Severity of impacts depends upon the sensitivity of the area, the visual absorption capability of the landscape, the viewing distance, and the degree of contrast in line, form, color, and texture that the project would create. Visual contrasts in agricultural settings were generally found to be moderate in degree; while greater contrasts were noted in natural landscapes, particularly at Naturita Canyon due to long views of conductors and the potential for marker balls being required by FAA at canyon crossing.		
Socioeconomics (EIS Section 3.11)			
Impact Findings: 115 kV Line, Substations, 69 kV Line Removal and Other Distribution Changes –	***High*** *to Moderate –* – Potential impacts to property values: houses/undeveloped lots within 300 feet of alignment – 21/34 – Social concerns about non-renewable energy use *Beneficial Effects –* – Local Tax Revenues – Increased Power Reliability	***High*** *to Moderate –* – Potential impacts to property values: houses/ undeveloped lots within 300 feet of alignment - 5/16 – Social concerns about non-renewable energy use *Beneficial Effects –* – Local Tax Revenues – Increased Power Reliability	***High*** *to Moderate –* – Potential impacts to property values: houses/ undeveloped lots within 300 feet of alignment - 5/2 – Social concerns about non-renewable energy use *Beneficial Effects –* – Local Tax Revenues – Increased Power Reliability
Summary:	High or moderate direct and indirect impacts to local communities, housing and services, would not result from the presence of crews and activities during the short-term construction phase. The majority of the construction work force would be from nearby communities (e.g. Montrose, Norwood, Ridgway). The project would have beneficial effects on the local economy due to spending by construction crews and increases in tax revenues to local jurisdictions. Potentially adverse effects include effects of the project on local property values. Potential impacts to property values may range from high to low beyond 300 feet depending on unique characteristics of property, scenic views, and visibility of lines and cultural features.		
Transportation (EIS Section 3.12)			
Impact Findings: 115 kV Line, Substations, 69 kV Line Removal and Other Distribution Changes –	*Moderate –* – Short-term impacts to SH 145	Low – – Short-term impacts to local roads and traffic conditions	Low – – Short-term impacts to local roads and traffic conditions

Table S-1
Summary of Impact Findings - Nucla-Norwood Primary System Alternatives

Evaluation Factors	Nucla-Norwood Alternatives		
	Northern	**Central**	**Southern**
Access Roads (Miles of roads to be used/improved) –	BLM roads: 0.6 mile Montrose and San Miguel county roads: 15.7 miles	BLM roads: 9.3 miles Montrose and San Miguel county roads: 39.2 miles	BLM roads: 21.8 miles Montrose and San Miguel county roads: 60.2 miles
Summary:	Construction of the project may require new roads or improvements to existing roads that could impact natural resources. Natural resource impacts are discussed in the respective resource sections (e.g. Soils, Water Resources, Biological Resources). The construction and maintenance of the project would also require the use of existing public BLM roads and local county roads. Construction crews may also cause short-term impacts to traffic and traffic delays. All traffic-related impacts are considered short-term and mitigable through standard traffic control measures.		
Noise (EIS Section 3.13)			
Impact Findings: 115 kV Line, Substations, 69 kV Line Removal and Other Distribution Changes –	*Moderate* – – 87 residences within the corridor	***High*** – – quality of dispersed recreation and residential settings due to helicopter construction *Moderate* to Low – – 36 residences within corridor	***High*** - – quality of dispersed recreation and residential settings due to helicopter construction *Moderate* to Low – – 12 residences within corridor
Summary:	Construction activities may cause short-term noise impacts due to construction crews, activities and equipment. Potentially high short-term effects may occur to sensitive receptors (e.g. residents, recreationists) when helicopter construction methods are used. Impacts are considered mitigable, with residual effects being in the low to moderate range. Long-term noise impacts to residents located near substations would be low.		
Human Health and Safety (EIS Section 3.14 and Appendix H)			
Impact Findings: 115 kV Line, Substations, 69 kV Line Removal and Other Distribution Changes –	No adverse effects anticipated.	No adverse effects anticipated.	No adverse effects anticipated.
Summary:	Over most of the ROW, the electric field would be below the perception level for humans. Anticipated use of the right-of-way is transitory. Both electric and magnetic fields from the proposed line outside the ROW would be comparable or lower than levels of magnetic fields measured close to some common household appliances. Operational experience over several decades with 230 kV and higher voltage transmission lines has indicated no adverse biological or health effects related to electric or magnetic field exposure. The current state of epidemiological and laboratory evidence is not sufficient to support a conclusion that the proposed transmission line poses any adverse health or biological effects. Therefore, the electric and magnetic fields of the project are not anticipated to cause adverse health or biological effects.		

Table S-2
Summary of Impact Findings
Norwood to Sunshine Substation Alternative and Norwood to Telluride Substation Alternative

Evaluation Factors	Norwood-Sunshine Alternative	Norwood-Telluride Alternative
Summary of Project Characteristics		
PROJECT CHARACTERISTICS:		
Length of Line:	28.3 miles	29.5 miles
Jurisdiction – By Public and Private		
- Public BLM	*1.1 mile*	*6.3 miles*
- U.S. Forest Service	*1.1 mile*	*0.7 mile*
- State of Colorado	*0.6 mile*	*None*
- Private (San Miguel County)	*25.5 miles*	*22.5 miles*
Approximate No. of Poles by Type		
- Single Poles	*305*	*305*
- H-frame and 3-Pole Structures	*20*	*35*
Total No. of Pole Structures	*325*	*340*
Estimated Amount of Ground Disturbance	*174.2 acres*	. *262.2 acres*
Climate and Air Quality (EIS Section 3.2)		
Impact Findings: **115 kV Line, Substations, 69kV Removal and Other Distribution Changes –**	Low *to Moderate*	Low *to Moderate*
Summary:	Short-term impacts on air quality may result from construction equipment and vehicles due to the increased fugitive dust, hydrocarbons, carbon monoxide and nitrogen dioxide. Impacts would be greatest near residences and where access roads are improved. No high impacts would occur since effects would be short-term and no violation of air quality standards would result. Although the Telluride Substation and eastern edge of this alternative are located in the Telluride PM10 non-attainment area, implementation of this project would not cause or contribute to the non-attainment designation. PM10 levels in the area have been below the standard since 1995 and the trend through 1997 has been decreasing. In addition, the greatest potential for emissions to occur with any of the alternatives is during the spring/summer construction period, while the greatest levels in PM10 typically occur during the winter periods.	

Table S-2
Summary of Impact Findings
Norwood to Sunshine Substation Alternative and Norwood to Telluride Substation Alternative

Evaluation Factors	Norwood-Sunshine Alternative	Norwood-Telluride Alternative
Geology, Paleontology and Mineral Resources (EIS Section 3.3)		
Impact Findings: 115 kV Line –	***High - 4.2 miles*** *Moderate - 7.0 miles*	***High – 14.9 miles*** *Moderate - 4.5 miles*
Summary:	High impacts, associated with geologic hazards (such as slope instability and rockfalls at canyon crossings), could occur where the transmission line would cross very steep slopes (50% and greater). Moderate impacts would likely occur in areas of steep slopes (between 30 and 49%). Potential moderate impacts are also identified in areas where the line would cross geologic formations potentially yielding fossils of scientific value. Such formations include the Morrison, Cutler and Dolores. High impacts may also occur where the line crosses near known mining activities (Norwood-Telluride: 3 sites; Norwood-Sunshine: 1 site) and in very steep slope areas with uranium resources. Mitigation measures could be used to reduce potential impacts to low levels.	
Soils (EIS Section 3.4)		
Impact Findings: 115 kV Line –	***High - 2.8 miles*** *Moderate - 4.3 miles*	***High - 9.6 miles*** *Moderate - 2.7 miles*
Summary:	High impacts could occur where the project would cross very steep slopes with high erosion potential. Moderate effects are identified in high erosion potential soils characterized by steep slopes. With implementation of potential mitigation measures, impacts are mitigable to low levels.	
Water Resources (EIS Section 3.5)		
Impact Findings: 115 kV Line –	***High - 7*** *Moderate - 48*	***High - 10*** *Moderate 39*
Summary:	Impacts to water resources could occur if project-related disturbances resulted in increased sedimentation and degradation of water quality. Impacts listed above reflect numbers of crossings of water resource areas. High impacts could occur where the line would cross wetlands, water bodies, major streams with riparian values and major drainages where improved access is proposed. Potentially high impacts would occur along the Norwood-Sunshine Alternative at 5 major drainage crossings, including Fall Creek, Beaver Creek, a tributary to Beaver Creek, Gurley Canyon, and Saltado Creek. Approximately 15 small wetlands, that could be spanned are also crossed. High impacts along the Norwood-Telluride Alternative include these drainage crossings, as well as 3 additional drainages and wetlands along the San Miguel River Canyon. Moderate impacts are indicated where the project could have direct or indirect effects to adjacent wetlands, major drainages, minor drainages with riparian values and minor drainages where improved access is proposed. With potential mitigation measures, high impacts could be avoided through careful pole placements or other means. It is anticipated that all impacts to water resources are mitigable to low or moderate levels.	

Table S-2
Summary of Impact Findings
Norwood to Sunshine Substation Alternative and Norwood to Telluride Substation Alternative

Evaluation Factors	Norwood-Sunshine Alternative	Norwood-Telluride Alternative
Biological Resources (EIS Section 3.6)		
Impact Findings: 115 kV Line –	*Moderate* – - Direct loss of habitat for Mexican Spotted Owl, if present. 48 acres of suitable habitat within the ROW - Indirect impacts to Gunnison sage grouse due to increased avian predation, and habitat avoidance from presence of overhead structures. Moderate impacts to Beaver Mesa population. 3,090 acres of overall range. 1,720 acres of nesting habitat within 1 mile of line. - Disturbance or mortality to other riparian dependent sensitive wildlife. Moderate impacts. 6 riparian stream crossings and 19 non-riparian stream crossings	*Moderate* – - Direct loss of habitat for Mexican Spotted Owl, if present. 134 acres of suitable habitat within the ROW - Indirect impacts to Gunnison sage grouse due to increased avian predation, and habitat avoidance from presence of overhead structures. Moderate impacts to Beaver Mesa population. 3,090 acres of overall range. 1,720 acres of nesting habitat within 1 mile of line - Disturbance or mortality to other riparian dependent sensitive wildlife. Moderate impacts. 9 riparian stream crossings and 16 non-riparian stream crossings
Substations –	No high or moderate impacts	No high or moderate impacts
Removal of 69 kV Line and Other Distribution Changes –	*Moderate* – - Disturbance or mortality to other riparian dependent sensitive wildlife. Moderate impact. Parallels 1 riparian stream for ¼ mile and 1 non-riparian stream crossing	*Moderate* - - Direct loss of Mexican spotted owl habitat. Moderate impacts if spotted owls are present. 38 acres of suitable habitat within the ROW.
Summary:	With implementation of the EPMs that have been committed to by Tri-State, and would be required by the Forest Service and BLM on public lands, impacts to vegetation communities, including riparian habitats, should be low. Similarly, many impacts to special status wildlife would also be minimized to low or moderate levels through implementation of the EPMs including potential mortalities to bald eagles and other raptors due to collisions or electrocutions from the power lines. Potentially high impacts have been identified where the project may result in indirect impacts to Mexican spotted owls, due to suitable habitat within one mile of the ROW, and to Southwestern willow flycatchers, due to suitable habitat within 0.25 mile of the alignment. High impacts to Gunnison sage grouse also reflect potential indirect impacts due to disturbances to suitable habitat within one mile of the alignment. Moderate impacts have been identified for potential direct and indirect impacts to bald eagle day roost sites and to important winter ranges for elk and mule deer.	
Cultural Resources (EIS Section 3.7)		
Impact Findings: 115 kV Line and Substations –	***High Impact Potential*** – – 405.5 Acres *Moderate Impact Potential* – – 4,773.6 Acres	***High Impact Potential*** – – 405.9 Acres *Moderate Impact Potential* – – 4,576 Acres

Table S-2
Summary of Impact Findings
Norwood to Sunshine Substation Alternative and Norwood to Telluride Substation Alternative

Evaluation Factors	Norwood-Sunshine Alternative	Norwood-Telluride Alternative
Removal of 69 kV Line and Other Distribution Changes –	***High Impact Potential --*** – 6.8 Acres	***High Impact Potential --*** – 6.8 Acres
Summary:	Potential impacts to cultural resources are based upon the cultural resource sensitivity of the landscapes and the degree of disturbance that project-related access would cause. Within the project area, high sensitivity areas include areas within one mile of canyon rims with permanent water, overhangs and ridge tops, areas of pinyon juniper on the edges of sagebrush, areas of historical mining and agricultural settlements. Impacts shown reflect the potential sensitivity of lands within the alternative corridors. Impacts to cultural resources would be mitigable to low levels through implementation of the EPMs, including conducting 100% surveys of the final alignment, access roads and pole sites.	
	Land Use (EIS Section 3.8)	
Potential Jurisdictions Affected: 115 kV Line –	Forest Service: 1.1 miles BLM: 1.1 mile State of Colorado: 0.6 mile San Miguel County private lands: 25.1 miles	Forest Service: 0.7 mile BLM: 6.3 miles State of Colorado: none San Miguel County private lands: 22.5 miles
Substations –	.09 Acre (.05 UNF; .04 County)	.04 Acre (.02 UNF; .02 County)
Removal of 69 kV Line and Other Distribution Changes –	Forest Service: none BLM: none State of Colorado: none San Miguel County private lands: 2.4 mile	Forest Service: none BLM: none State of Colorado: 0.6 mile San Miguel County private lands: 2.4 mile
Impact Findings: **115 kV Line, Substations and Distribution Lines –**	***Existing Land Uses:*** ***High -*** – Irrigated Agriculture - 1.0 mile – Prime farmlands – 0.1 mile – Potential direct impacts to residential structures in ROW: 2 structures	***Existing Land Uses:*** ***High -*** – Irrigated Agriculture - 1.0 mile – Prime farmlands – 0.1 mile – Potential direct impacts to residential structures in ROW: 2 structures
	Moderate - – Indirect impacts: Residences within 300 feet of alignment: 10 – Indirect impacts: Total residences within 0.5 mile of alignment: 92 – Direct and indirect impacts to approved developments: 6 (Fitts Sub., Beaver Pines, Specie Mesa Ranch, Top of the World, Wilson Mesa Ranch and Ptarmigan Ranch)	*Moderate –* – Indirect impacts: Residences within 300 feet of alignment: 9 – Indirect impacts: Total residences within 0.5 mile of alignment: 81 – Direct and indirect impacts to approved developments: 4 (Fitts Sub., Beaver Pines, Specie Mesa Ranch, Top of the World) Potential conflicts with 3 employee residences planned by CDOT at Deep Creek (Lime)

Table S-2
Summary of Impact Findings
Norwood to Sunshine Substation Alternative and Norwood to Telluride Substation Alternative

Evaluation Factors	Norwood-Sunshine Alternative	Norwood-Telluride Alternative
Land Use (EIS Section 3.8) **Impact Findings:** **115 kV Line, Substations and Distribution Lines –** *continued*	***Planned Land Uses:*** ***High –*** San Miguel County Priority Lands Affected – – irrigated farmlands, meadows and pastures: 11.3 mile – skylines visible from SH 145: no identifiable effect – impacts to natural streams and ponds: see section 3.5 water resources summary – geologic hazards: see section 3.3 summary – impacts to lands having significant cultural resources: see section 3.7 cultural resource summary *Moderate –* Forest Service Management Area 2B: 1.1 miles crossed BLM Emphasis Areas L1 (San Miguel River ACEC) and C1 (San Miguel River Canyon SRMA): 1.1 miles San Miguel County Priority Lands Affected – – impacts to critical wildlife areas: see section 3.6 biological resources summary	***Planned Land Uses:*** ***High –*** San Miguel County Priority Lands Affected – – irrigated farmlands, meadows and pastures: 7.4 mile – skylines visible from SH 145: see section 3.10 visual resources summary – impacts to natural streams and ponds: see section 3.5 water resources summary – geologic hazards: see section 3.3 summary – impacts to lands having significant cultural resources: see section 3.7 cultural resource summary *Moderate –* Forest Service Management Area 2B: 0.7 mile crossed BLM Emphasis Areas L1 (San Miguel River ACEC) and C1 (San Miguel River Canyon SRMA): 6.3 miles San Miguel County Priority Lands Affected – – impacts to critical wildlife areas: see section 3.6 biological resources summary
Summary:	Potential impacts addressed in this section include direct and indirect effects to existing residential, commercial, industrial and agricultural land uses and conformity with adopted plans of the Forest Service, BLM and Counties. High impacts are identified in instances where direct conflicts with existing land uses that are important socially and economically may occur. Moderate effects are identified where indirect effects to existing land uses would occur during the short-term construction phase. Impacts to existing land uses are considered to be mitigable to low or moderate levels through careful pole placement and final ROW planning and design. Potential effects to San Miguel County reflect the degree to which the project would affect lands identified in the Comprehensive Development Plan (CDP, 1999) as Priority Class 2 or 3 lands that should be avoided in siting powerlines. No priority class I lands would be affected.	
Recreation (EIS Section 3.9)		
Impact Findings: **115 kV Line, Substations and Distribution Lines –**	***High Impacts:*** None Low to *Moderate* Impacts: – Faraway Ranch. Dispersed uses during construction.	*Moderate* to ***High Impacts:*** – San Miguel River Corridor, San Miguel River activities, boater put-ins at Bilk Creek and Deep Creek Galloping Goose Trail, Mary E. Campground, impacts to scenic driving along SH 145 (see section 3.10, visual resource summary)

Table S-2
Summary of Impact Findings
Norwood to Sunshine Substation Alternative and Norwood to Telluride Substation Alternative

Evaluation Factors	Norwood-Sunshine Alternative	Norwood-Telluride Alternative
Summary:	Potential impacts to quality of recreation experiences would primarily occur during the project construction period, when equipment, vehicles, helicopters and related activities would cause short-term noise, dust and visual impacts. Impacts would be greatest in areas of helicopter construction and where recreation activities would be disrupted, particularly along the San Miguel River corridor.	
Visual Resources (EIS Section 3.10)		
Impact Findings: **115 kV Line –**	**Landscape Impacts:** – ***High:*** at 5 canyon crossings due to color contrasts of marker balls; – *Moderate to **High***: across agriculture, open meadows and pastures (11.3 miles); high mesas with adjacent mountain scenery influences (16.6 miles); including conifers (1.9 miles) and aspen stands (2.0 miles)	**Landscape Impacts:** – ***High:*** at 4 canyon crossings due to color contrasts of marker balls, across San Miguel River canyon slopes, and at crossings of visually prominent ridge lines (10.9 miles) – *Moderate to **High***: across agriculture, open meadows and pastures (7.4 miles); high mesas with adjacent mountain scenery influences (8.3 miles); including conifers (8.0 miles) and aspen stands (2.5 miles)
	Sensitive Viewer Impacts: – *Moderate to **High:*** Faraway Ranch private recreation area; up to 92 residences within FG distance zone; subdivision lots within FG distance zone; residences within MG distance zone with scenic view conflicts – *Moderate:* Specie Mesa Road (M44) and Bilk Creek Road/Trail (62.K); subdivision lots in MG distance zone with scenic view conflicts	**Sensitive Viewer Impacts:** – ***High:*** San Juan Skyway National Scenic Byway (SH 145 - 5 miles); Telluride Ski Resort gondola views; Last Dollar Road (T.60), San Miguel River Canyon SRMA, and County Road P.58 – *Moderate to **High:*** up to 81 residences within FG distance zone; subdivision lots within FG distance zone; residences within MG distance zone with scenic view conflicts; Bilk Creek Road/Trail (62.K) – *Moderate:* Specie Mesa Road (M44); ; subdivision lots in MG distance zone with scenic view conflicts, Deep Creek Trail and Mt. Sneffels Wilderness Area
Substations –	Low: Sunshine Substation, Specie Mesa and Wilson Mesa Substations	Low: Telluride and Specie Mesa Substation s - Low *Beneficial*: Removal of Wilson Mesa Substation
Removal of 69 kV Line and Other Distribution Changes –	*Moderate to **High:*** to residences from underbuilding of distribution lines across Fitts Subdivision and Specie Mesa	*Moderate to **High:*** to residences from underbuilding of distribution lines across Fitts Subdivisions and Specie Mesa *Beneficial Effects:* to residences and Faraway private recreation area from removal of existing 69 kV line between Wilson Mesa Substation and Sunshine Substation

Table S-2
Summary of Impact Findings
Norwood to Sunshine Substation Alternative and Norwood to Telluride Substation Alternative

Evaluation Factors	Norwood-Sunshine Alternative	Norwood-Telluride Alternative
Summary:	Visual impacts would be long-term and would result from the introduction of facilities into landscapes and views that are considered sensitive by the public or land management agencies. Severity of impacts depends upon the sensitivity of the area, the visual absorption capability (VAC) of the landscape, the viewing distance, and the degree of contrast in line, form, color, and texture that the project would create. Visual contrasts in agricultural settings were generally found to be moderate in degree due to the presence of cultural features with similar form and line visual elements. Moderate to high impacts are assessed in predominately natural landscapes with natural scenic amenities, including the high mesas with adjacent scenery influences of the San Juan Mountains and the San Miguel River Canyon and tributaries. In these types of landscapes, the scale of the poles and the horizontal lines of the conductors may cause strong contrasts, depending upon specific viewing conditions and the VAC of the land. In these landscape character types, high impacts are generally assessed for sensitive viewers within the foreground (FG) viewing distance zone (within 0.5 mile), and for viewers in the middle ground (MG) distance zone (0.5 to 3.0 miles) where the conductors may be visible and conflict with scenic views and vistas. High impacts are also assessed at canyon crossings where FAA may require colored marker balls for safety purposes.	
Socioeconomics (EIS Section 3.11)		
Impact Findings: 115 kV Line, Substations, 69kV Removal and Other Distribution Changes –	***High** to Moderate* – – Potential impacts to property values: single family houses/lots within 300 feet of alignment - 10/Not Available – Social concerns about non-renewable energy use *Beneficial Effects* – – Local Tax Revenues – Increased Power Reliability	***High** to Moderate* – – Potential impacts to property values: single family houses/lots within 300 feet of alignment –9/Not Available – Social concerns about non-renewable energy use *Beneficial Effects* – – Local Tax Revenues – Increased Power Reliability
Summary:	High or moderate direct and indirect impacts to local communities, housing and services, would not result from the presence of crews and activities during the short-term construction phase. The majority of the construction work force would be from nearby communities (e.g. Montrose, Norwood, Ridgway). The project would have beneficial effects on the local economy due to spending by construction crews and increases in tax revenues to local jurisdictions. Potentially adverse effects include effects of the project on local property values. Potential impacts to property values may range from high to low beyond 300 feet depending on the unique characteristics of property, scenic views, and visibility of line and other cultural features.	
Transportation (EIS Section 3.12)		
Impact Findings: 115 kV Line, Substations, 69 kV Removal and Other Distribution Changes –	Low - – Short-term impacts to public BLM and local roads	Low to *Moderate* - – Short-term impacts to SH 145 and SH 145/South Fork Road interchange
Access Roads (Miles of roads to be used/improved) –	BLM and FS roads: 25.8 miles Montrose and San Miguel County roads: 70.4 miles	BLM and FS roads: 21.3 miles Montrose and San Miguel County roads: 60.7 miles

Table S-2
Summary of Impact Findings
Norwood to Sunshine Substation Alternative and Norwood to Telluride Substation Alternative

Evaluation Factors	Norwood-Sunshine Alternative	Norwood-Telluride Alternative
Summary:	Construction of the project may require new roads or improvements to existing roads that could impact natural resources. Natural resource impacts are discussed in the respective resource sections (e.g. Soils, Water Resources, Biological Resources). The construction and maintenance of the project would also require the use of existing public BLM roads and local county roads. Construction crews may also cause short-term impacts to traffic and traffic delays. All traffic-related impacts are considered short-term and mitigable through standard traffic control measures.	
Noise (EIS Section 3.13)		
Impact Findings: 115 kV Line, Substations, 69 kV Removal and Other Distribution Changes –	***High -*** Approximately 25 residences located near helicopter construction activities Low to *Moderate -* Approximately 46 residences within the corridor	***High -*** Approximately 7 residences, 1 school, and public recreation lands located near helicopter construction activities *Low to Moderate -* Approximately 39 residences within the corridor
Summary:	Construction activities may cause short-term noise impacts due to construction crews, activities and equipment. Potentially high short-term effects may occur to sensitive receptors (e.g. residents, recreationists) when helicopter construction methods are used. Impacts are considered mitigable, with residual effects being in the low to moderate range. Long-term noise impacts to residents located near substations would be low.	
Human Health and Safety (EIS Section 3.14 and Appendix H)		
Impact Findings: 115 kV Line, Substations, 69 kV Removal and Other Distribution Changes –	No adverse effects anticipated.	No adverse effects anticipated
Summary:	Over most of the ROW, the electric field would be below the perception level for humans. Anticipated use of the right-of-way is transitory. Both electric and magnetic fields from the proposed line outside the ROW would be comparable or lower than levels of magnetic fields measured close to some common household appliances. Operational experience over several decades with 230 kV and higher voltage transmission lines has indicated no adverse biological or health effects related to electric or magnetic field exposure. However, the current state of epidemiological and laboratory evidence is not sufficient to support a conclusion whether the proposed transmission line poses any adverse health or biological effects.	

COMPARISON OF OVERHEAD AND UNDERGROUND TRANSMISSION TECHNOLOGIES

NORWOOD-TELLURIDE/SUNSHINE UNDERGROUND SUBALTERNATIVE

The FEIS analyzes undergrounding the 115 kV transmission across portions of Beaver Mesa (Link 13, mile markers 2.6 to 8.2), Specie Mesa (Link 13, mile markers 10.5 to 14.3), Wilson Mesa (Link 14, mile markers 2.0 to 3.2; Link 15, mile markers 0.0 to 1.3 and Link 15, mile markers 2.0 to 5.0), and Sunshine Mesa (Link 15, mile marker 5.3 to 5.9). The Beaver Mesa and Specie Mesa portions of this subalternative would apply to both the Norwood-Sunshine and Norwood-Telluride Alternatives. Undergrounding segments across Wilson and Sunshine Mesa are only applicable to the Norwood-Sunshine Alternative.

The underground subalternative would replace portions of the existing 69 kV overhead transmission line with an underground 115 kV cable. The subalternative consists of four stretches of privately-owned lands on Beaver, Specie, Wilson and Sunshine mesas. Between these mesas, the corridor crosses public lands characterized by steep canyon slopes, wetlands and creeks. Undergrounding across these types of canyon landscapes would result in substantially greater environmental impacts than the proposed overhead facility. In addition, these types of landscapes would present significant engineering constraints. Consequently, the scope of the FEIS analysis for an underground subalternative is limited to those scenic stretches of Beaver, Specie, Wilson and Sunshine mesas where terrain and geotechnical conditions are suitable to underground technologies and construction practices.

The FEIS analysis of the underground subalternative addresses the following key issues regarding underground transmission technology and its potential benefits and costs across portions of Beaver, Specie, Wilson and Sunshine Mesas:

- Tri-State's policy regarding undergrounding high voltage powerlines
- The engineering feasibility, construction and operation practices for underground cables
- Geotechnical and soils constraints for underground cables
- The life of the Project using the overhead versus underground technologies
- Cost comparisons for underground versus overhead transmission systems
- Environmental trade-offs

TRI-STATE'S POLICY REGARDING UNDERGROUNDING OF HIGH VOLTAGE POWERLINES

Tri-State's policy no. 113 sets forth the terms and conditions under which Tri-State would agree to construct a transmission line underground. This policy states that Tri-State will consider the construction of underground high voltage transmission facilities when local jurisdictions or landowners agree to advance the increased cost of constructing and operating the facilities, and that the increased cost of the underground facilities be borne by the local jurisdictions or landowners, not Tri-State. The Forest Service and BLM have taken no position with respect to supporting or not supporting Tri-State's policy. RUS has reviewed Tri-State's policy concerning undergrounding transmission facilities and found it to be a reasonable and prudent policy.

According to Tri-State, once a request to underground high voltage transmission facilities has been received, Tri-State will provide an estimate of the cost of construction and operation of comparable overhead and underground facilities in order to determine the

increased cost of undergrounding the transmission facility. This information will be provided to the jurisdiction or landowner making the request for undergrounding. Tri-State allows six months for landowners or jurisdictions to arrange for underground financing. The full policy is provided in FEIS Volume I, Appendix A-2.

Engineering Feasibility, Construction and Operation Practices for Underground Cables

Engineering Feasibility An engineering feasibility study was conducted by Power Engineers in 1999 that identified two types of potentially suitable cable systems: solid dielectric cable (XLPE) and high pressure gas filled (HPGF) pipe-type cable. Overall, the HPGF system is the most expensive and requires the most inspection and annual maintenance. The pressurization system also requires a monitoring system and regular maintenance. Few of these type systems have been built in recent years. Tri-State has stated they would build an XLPE type system if Policy 113 is implemented. The XLPE type system has, therefore, been considered for the underground subalternative.

Construction Practices Construction techniques for XLPE systems include direct burial and duct bank methods. With the direct burial method, three parallel pipe-type cable systems would be installed in a continuous trench. The trench would be three to five feet wide and five feet deep, with the cables placed at least three and one-half feet below ground level. Trenches for duct bank installations would also be three to five feet wide, with insulated cables placed close together. Tri-State has stated they would build an XLPE cable system using the duct bank installation method. Technically, the distribution cables could also be placed in the same trench with the 115 kV cables (Power Engineers, 2001). SMPA has indicated a separate trench, approximately 20 feet from the 115 kV cable would be required, however (SMPA, 2001).

Cable splices would be required about every one-half mile. During construction, the trench would have to remain open with the direct burial method. In comparison, the duct bank construction method would entail placing the cable in a concrete enclosure. A significant limitation of direct buried cables is their vulnerability to dig-in related damages after installation (e.g. from construction of other underground utilities, etc.). In comparison, the duct system provides supplemental dig-in protection for the cables, minimizing the probability of concurrent failures of adjacent cables or circuits, and minimizing the length of trench open at any one time. Manholes would be installed along the duct line at spacing not exceeding maximum cable pulling lengths. When cable faults occur in duct systems, the faulted cable section is pulled out and replaced between adjacent manholes.

For the line to be constructed underground, a continuous work area about 40 feet wide would be needed. Additionally, a new right-of-way might have to be acquired in areas where the trench would deviate from the proposed right-of-way centerline because of obstacles such as wetlands, steep slopes, areas of high erosion, and areas of rocky terrain. In some situations, wetlands probably may not be avoidable. Transition stations would be needed at the mesas' edges for the line to switch between underground and overhead as necessary. These stations generally require an area about 200 feet by 200 feet (about 0.9 acres). Bus work, termination structures, and a control equipment building would be required at each site. Maximum structure height would be about 80 feet.

Operation and Maintenance The permanent easement for an underground cable system would be between 20 to 40 feet in width, depending on terrain and whether distribution lines are also placed in the underground corridor.

Operation of XLPE underground transmission cable systems requires little, if any, operator intervention. The systems are designed to operate automatically. The maintenance of XLPE systems is limited to inspection, testing and preventive maintenance, and repair or replacement of cables, splices and terminations.

A limitation of the XLPE cable systems is the deterioration of cable insulation over time. Non-destructive tests for evaluating the condition of XLPE cable include measurement of DC leakage current, dielectric loss power factor, and AC partial discharge. Two additional tests, absorption current and residual voltage measurements, have been developed in Japan. Unfortunately, none of these tests reliably indicate remaining cable life or cable condition.

Repairs of underground cable systems can be substantial in terms of time and costs. Repair of cable splices and terminations involves locating the faulted component; digging to expose a failed splice, if direct buried, or locating a failed splice in a manhole or a failed termination on a termination structure or in a substation; and repairing or replacing the component as required. Surface improvement restoration may also be required after repair or replacement of a direct buried splice.

Typical outage times for XLPE systems are estimated at one week as compared to 20.5 hours for overhead systems. The times estimated for XLPE systems include fault location and repair times only. If fault location and repair procedures are to be performed by a contractor, contract preparation, bid and award times, and contractor mobilization time must be added to the typical outage times.

Geotechnical and Soils Constraints

The engineering feasibility of undergrounding the 115 kV line depends on terrain and geotechnical conditions. In general, underground technology is not considered feasible nor practical in areas characterized by mountainous terrain, steep slopes, extensive bedrock outcroppings, canyons and waterways due to engineering, environmental and cost reasons. Undergrounding the 115 kV line is most feasible in areas where access, terrain and geologic conditions are more favorable.

Buckhorn Geotech was retained by the Forest Service in 1999 and 2001 to evaluate whether Beaver, Specie, Wilson and Sunshine Mesas present significant geotechnical or soil constraints to undergrounding the transmission line. Corridor areas across the mesas were evaluated according to whether they are (1) opportune areas for undergrounding, (2) areas of moderate opportunity and limitations; or (3) areas that are severely limited for the underground technology. In general the following types of conditions were associated with these three constraint or opportunity levels:

(1) *Opportune Areas* – are considered most suitable for underground installation. These areas are characterized by slopes of less than 30 percent, underlain by favorable soils (no shallow bedrock or rock outcroppings), where excavation should be relatively easy, little or no groundwater encountered, and environmental constraints related to wetlands and riparian areas are anticipated to be minimal. Normal construction practices and procedures would be appropriate in these type areas.

(2) *Areas of Moderate Opportunity and Limitation* – would present some limitations to undergrounding the transmission line. These types of areas include those on gentle to steep slopes that are underlain at a shallow depth by Dakota Sandstone or the Morrison formation bedrock materials. Moderate constraint areas would also apply to corridor segments with steep slopes combined with areas of erodible soil or soils having a potential for shrink/swell volume changes. Areas of wetlands, riparian vegetation or shallow groundwater are also considered to be moderately limited or constrained. Along with standard construction methods, some additional mitigation may be required to dispose of excess rock fragments, de-water trenches, and control erosion through revegetation.

(3) *Severely Limited Areas* – are those having outcrops of either Dakota Sandstone or Morrison Formation and areas of very steep slopes with highly erodible soils or soils having a potential for shrink/swell volume changes. Excavation in rock outcrop areas may encounter difficulties in excavation or require occasional blasting. Construction on very steep slopes having sensitive soils could result in large areas of disturbance which could require extra precautions to preserve slope stability and/or to mitigate the impacts of construction as it relates to erosion control and revegetation.

Table S-3 summarizes the geotechnical and soils study findings across the mesas.

Table S-3
Summary of Findings - Opportunities and Limitations for Undergrounding the Proposed Nucla-Telluride 115 kV Transmission Line Across Parts of Beaver, Specie, Wilson and Sunshine Mesas

Underground Corridor Segment	Opportune Areas	Areas of Moderate Limitations	Areas of Severe Limitations
Beaver Mesa	1.5 miles	4.1 miles	0.0 miles
Specie Mesa	0.3 miles	2.9 miles	0.6 miles
Wilson Mesa	3.5 miles	2.1 miles	0.0 miles
Sunshine Mesa	0.5 miles	0.1 miles	0.0 miles
Totals	4.3 miles	5.1 miles	0.6 miles

Beaver Mesa – Beaver Mesa is primarily characterized as having moderate constraints for undergrounding the line due to soils with high erosion potential and shallow bedrock (3.4 miles), as well as the crossing of one riparian/wetland vegetation community (0.7 mile). No severely limited areas were identified.

Specie Mesa – The majority of Specie Mesa was found to be moderately constrained to undergrounding the line. Factors contributing to moderately constrained areas of Specie Mesa include steep slopes (greater than 30%) soils of high erosion or shrink/swell potential and shallow bedrock. Severe limitations were also identified for 0.6 mile, where very steep slopes (greater than 50%) with highly erodible soils would be crossed.

Wilson Mesa – Most stretches (3.5 miles) of Wilson Mesa were determined to be opportune areas for undergrounding. Approximately 2.1 miles across the mesa presented moderate constraints to undergrounding, due to the presence of steep slopes (greater than 30%), shallow groundwater conditions, or the presence of riparian/wetlands vegetation. No severely limited areas were found.

Sunshine Mesa – Across Sunshine Mesa, geotechnical and soils conditions provide opportune conditions for undergrounding, except for less than one-tenth of a mile, where steep slopes are encountered.

Cost Comparison for Overhead and Underground Transmission Systems

Table S-4 summarizes and compares the costs of constructing the proposed 115 kV transmission line overhead and underground across Beaver, Specie, Wilson and Sunshine mesas. The cost estimates for the underground XLPE direct burial and duct bank systems were developed by Power Engineers in September 2001, and are based on geotechnical and soil conditions (Appendix A-5). Costs for the overhead transmission line were developed by Tri-State (Appendix A-1) and were independently reviewed by AESC, as part of the distributed generation alternatives analysis.

Numerous comments were received on the DEIS regarding the comparative costs of overhead and underground transmission line technologies and the factors considered in developing these estimates. For the purposes of the FEIS, information is provided on the general magnitude of costs associated with materials and construction for each technology. On a property by property basis, it is recognized that easement costs may vary significantly depending on location, size, relative location and distance from the transmission line, scenic views, etc. Section 3.11 of the FEIS discusses potential property value impacts. Costs may also vary depending on the life of the project and replacement values, as well as increased engineering and design necessary for an underground system. Although wide variances in land values and effects may occur on an individual property basis, cost considerations for individual landowners are beyond the scope of an EIS and are unlikely to alter the overall magnitude of total cost differences amongst the technologies.

In order to respond to commenters' concerns for 'apples' to 'apples' comparison of the overhead and underground transmission costs, the land acquisition costs for easements have not been estimated for either technology in *Table S-4*. It is important to note that the amount of land needed for overhead and underground transmission line easements would differ. Based on a 40-foot wide easement for an underground cable, approximately 4.8 acres per mile would be acquired for this type of easement. In comparison, the overhead transmission line system would require between 9.1 to 12.1 acres per mile, depending on whether the easement is 75 feet wide (for single poles) or 100 feet wide (for h-frame and three pole structures).

Table S-4
Cost Comparison of Overhead Versus Underground XLPE Transmission Construction

Location	Approximate Length (miles)	Overhead Construction Costs* ($176,077.74)	Underground Construction Costs**		Cost Differences from Overhead Construction	
			Duct Bank	Direct Burial	Duct Bank	Direct Burial
Beaver	5.6	$986,035.34	$8,209,329.00	$6,265,708.00	$7,223,293.66	$5,279,672.66
Specie	3.8	$669,095.41	$5,493,883.00	$5,170,040.00	$4,824,787.59	$4,500,944.59
Wilson	5.5	$968,427.57	$7,919,762.00	$7,401,826.00	$6,951,334.43	$6,433,398.43
Sunshine	0.6	$105,646.64	$1,054,099.00	$986,823.00	$948,452.36	$1,092,469.64
Totals:	**15.5**	**$2,729,204.96**	**$22,677,073.00**	**$19,824,397.00**	**$19,947,868.04**	**$17,306,485.32**

Notes:
** Overhead cost estimates based on Tri-State's average costs of $176,077.74 per mile. Does not include costs of ROW acquisition or property value decreases*
***Underground Cost estimates based on Power Engineers estimates. Does not include ROW acquisition, engineering, increased maintenance costs or replacement costs due to differences in project life expectancy. Also does not include costs for undergrounding distribution lines or directional drilling costs, if required (see Appendix A-5).*

LIFE OF THE PROJECT

The underground and overhead technologies differ with respect to the life of the project. As discussed under Operation and Maintenance, the XLPE cable systems are susceptible to the deterioration of cable insulation over time. Cable splices, which would be required about every 0.5 mile, also present long-term, operational limitations on the life of the project. Average life expectancies of an underground 115 kV transmission cable have been estimated by Power Engineers to be approximately 30 to 35 years. In comparison, the overhead transmission technology has a proven life expectancy of approximately 50 years.

Environmental Trade-offs

The proposed overhead 115 kV transmission line would result in long-term adverse visual impacts to scenic landscapes of Beaver, Specie, Wilson and Sunshine Mesas. Private landowners and residences of the mesas would be the primary group affected. Visual impacts from the proposed overhead facility may be avoided or substantially reduced in some instances through careful planning of the right-of-way within the overall corridor, specific pole placements and screening with trees. Compact and shorter pole designs may also be effective in reducing visual impacts, particularly through aspen groves and conifers. Tri-State has indicated pole heights may be reduced to 60 feet where compact pole spacings are used. Nonetheless, significant adverse impacts to scenic views are likely to be unavoidable for some residents and landowners. Visual impacts from the overhead line may also affect land values, depending upon specific viewing conditions. These visual and land value impacts would be largely avoided by the underground subalternative, although overhead transition structures would still be required on the mesa rims. In addition, the long-term visual impacts of spanning the canyons would still remain with the underground subalternative.

Although the visual benefits of undergrounding would be significant, undergrounding the transmission cable would result in greater ground disturbances that the proposed overhead facility. The continuous trench and work area would directly impact a variety of natural biological and wetland areas. Most of these impacts could be mitigated through special construction practices and post-construction revegetation. The environmental trade-offs of the overhead and underground 115 kV transmission technologies are summarized in *Table S-5*.

COMPARISON OF TRANSMISSION AND DG ALTERNATIVES

The major benefits and costs of the Distributed Generation (DG) and Transmission Alternatives have been compared based on the following criteria:

- Degree to which the alternatives meet Tri-State's purpose and need for increased regional power transfer capability across the TOT2A transmission grid and increased load serving capacity in southwestern Colorado
- Degree to which the alternatives meet the need for improved power reliability in the Telluride Area and surrounding communities in southwestern Colorado
- The range, type and scale of facilities required for each alternative
- The major environmental tradeoffs associated with the DG and Transmission Alternatives
- The cost comparison of the DG and Transmission Alternatives

Regional Power Transfer Capability and Load Serving Capacity. All 115 kV transmission alternatives would fully meet the purpose and need for increased regional power transfer and load serving capacity. Engineering studies conducted for the EIS conclude that a properly designed distributed generation alternative could meet most of the purpose and need issues set forth by Tri-State. The Large DG Alternative could fully meet the regional power transfer capabilities desired, as well as provide for some increased load serving capacity in southwestern Colorado. The Small DG Alternative would meet these needs to a lesser degree, while the Emergency DG Alternative would not provide any regional benefits. *Table S-6* shows the comparison of the regional and load serving benefits of the DG alternatives with the proposed 115 kV transmission line.

Table S-5 Summary of Environmental and Cost Trade-offs between Overhead and Underground Transmission Line Technologies		
Issue	**Underground Cable**	**Overhead Transmission Line**
Beaver Mesa – Norwood-Sunshine or Norwood-Telluride Alternative		
Length:	5.6 miles	5.6 miles
ROW requirements: (acres)*	13.5 to 27 acres	50 acres
*Construction Costs**:*	$8,209,329.00	$986,035.34
Life of the Project:	30 to 35 years	50 years
Ground Disturbance:	Approximately 7 acres	Less than one acre
Geotechnical and Soils:	Moderate limitations – 4.1 miles Opportune areas – 1.5 miles	Moderate to low limitations in similar conditions due to potential avoidance of sensitive areas through pole placements/spacing.
Water Resources:	Potential direct impacts where trench alignment crosses Wolf Gulch 3 times, a drainage associated with Huff Gulch once, a tributary to Beaver Canyon 3 times, and parallels this drainage for 1.0 mile.	Direct impacts to water resources would be avoided by pole placements.
Biological Resources – Vegetation Communities	Vegetation removed along 5-foot-wide trench (approx. 3.4 acres). Trench would primarily impact some grass forbs and sagebrush/grass rangeland. Some Ponderosa pine/Gambel oak, Englemann spruce, Englemann spruce/aspen mix, Douglas fir/Gambel oak upland Willow scrub and Pinyon-Juniper sagebrush mix may also be impacted. Small palustrine wetlands at mile markers 6.5 and 8.0. Impacts to vegetation should be limited.	Vegetation removed primarily at pole sites, although selective clearing of right-of-way may be necessary.
Biological Resources – Sensitive Wildlife Habitat	Would result in long-term beneficial effects to Gunnison sage grouse, by eliminating potential perching sites for raptors.	Would result in long-term adverse effects to Gunnison sage grouse due to potential for increased avian predation.
Visual Resources	Beneficial long-term effects by eliminating the 69 kV line and avoiding increased impacts to taller poles and conductors. Property currently undeveloped except for one cabin.	Substantial adverse effects due to the cumulative visual effects of the existing 230/345 kV lattice towers and the proposed 70-foot 115 kV transmission line poles. Cumulatively, the utility facilities currently create strong visual contrasts across much of the mesa.
Land Use and Property Values	Beneficial effects to property values and long-term development potential.	Adverse effects to property values are likely. Property is already affected by the presence of the 230 and 345 kV lattice structures, as well as the existing 69 kV wood poles.
Specie Mesa – Norwood-Sunshine or Norwood-Telluride Alternative		
Length:	3.8 miles	3.8 miles
ROW requirements: (acres)*	9.2 to 18.4 acres	34.4 acres
*Construction Costs**:*	$5,493,883.00	$669,095.41
Life of the Project:	30 to 35 years	50 years
Ground Disturbance:	Approximately 5 acres for trench	Less than an one acre
Geotechnical and Soils:	Severe limitations – 0.6 mile Moderate limitations – 2.9 miles	Moderate to low limitations in similar conditions due to potential avoidance of sensitive areas through pole spacing/placements.
Water Resources:	Trench would directly impact four wetland/-water bodies including Specie Creek drainage, Hughes ditch and two tributaries to Specie Creek	Direct impacts to wetland/water resources would be avoided by pole placements.

Table S-5 Summary of Environmental and Cost Trade-offs between Overhead and Underground Transmission Line Technologies		
Issue	**Underground Cable**	**Overhead Transmission Line**
Biological Resources – Vegetation Communities	Vegetation entirely removed along 5 foot wide trench. Vegetation types removed would primarily be grasslands and forb rangeland. Minor amounts of aspen, Gambel oak and upland willow scrub may also be impacted. These impacts to vegetation could be largely avoided by using the Stock Drive Road realignment.	Vegetation removed primarily at pole sites although selective clearing of ROW may be necessary. Same vegetation types would be affected as underground subalternative, although direct impacts to aspens would be largely avoidable through pole placements.
Biological Resources – Sensitive Wildlife Habitat	None	None
Visual Resources	Substantial beneficial effects. Beneficial effects would be long-term and include the removal (existing 44/69 kV line) and avoidance (of new 115 kV line) of impacts to scenic views from residential homes and subdivisions, including the Peninsula, Estate Ranches, Top of the World, Specie Mesa Ranch, Specie Wilderness and Specie Ridge developments.	Substantial adverse effects. Adverse effects would be long-term and result from the installation of the 115 kV poles and conductors. Proposed project poles would be almost twice as large as existing 44/69 kV poles, resulting in increased visibility of the conductors. Same residential developments would be affected.
Land Use and Property Values	Substantial beneficial effect to property values due to removal of 44/69 kV line. Adverse effects to land use options due to easement restrictions.	Potentially significant adverse effect to property values due to the replacement of the 44/69 kV line with the larger 115 kV line. Easement to increase from 25 feet to 75 or 100 feet in width. Adverse effects to land use options within easement.
Wilson Mesa – Norwood-Sunshine Alternative		
Length:	5.5 miles	5.5 miles
ROW requirements: (acres)*	13.4 to 26.8 acres	50 acres
*Construction Costs**:*	$7,919,762.00	$968,427.57
Life of the Project:	30 to 35 years	50 years
Ground Disturbance:	Approximately 7 acres for trench	Less than one acre
Geotechnical and Soils:	Moderate limitations – 2.1 miles Opportune areas – 3.4 miles	Low impacts or limitations in similar conditions due to potential avoidance of sensitive areas through pole spacing/placements.
Water Resources:	Trench would directly impact 3 wetlands, 1 irrigation ditch, 1 riparian vegetation area, 1 tributary and 2 drainages of Muddy Creek, 1 tributary drainage of Bilk Creek. Wetland area is classified as a fen. Avoidance is possible with careful trench placement.	Direct impacts to wetland/water resources would be avoided by pole placements. Indirect impacts from erosion and sedimentation could occur.
Biological Resources – Vegetation Communities	Vegetation entirely removed along 5 foot wide trench (approx. 3.3 acres). Vegetation types removed would primarily be grasslands and forb rangeland. Minor amounts of aspen, Gambel oak, upland willow scrub, Douglas fir and Englemann spruce/aspen mix would also be impacted.	Vegetation removed primarily at pole sites although selective clearing of ROW may be necessary. Same vegetation types would be affected as underground sub-alternative, although direct impacts to aspens would be largely avoidable through pole placements
Biological Resources – Sensitive Wildlife Habitat	Direct impacts to habitat for Mexican Spotted Owl.	Direct impacts to habitat for Mexican Spotted Owl at pole sites only.

Table S-5
Summary of Environmental and Cost Trade-offs between Overhead and Underground Transmission Line Technologies

Issue	Underground Cable	Overhead Transmission Line
Visual Resources	Substantial beneficial effects. Beneficial effects would be long-term and include the removal (existing 44/69 kV line) and avoidance (of new 115 kV line) of impacts to scenic views from residential homes and subdivisions, including Wilson Mesa and Ptarmigan Ranch developments.	Substantial adverse effects. Adverse effects would be long-term and result from the installation of the 115 kV poles and conductors. Proposed project poles would be twice as large as existing 44/69 kV poles, resulting in increased visibility of the conductor as well. Same residential developments would be affected.
Land Use and Property Values	Substantial beneficial effect to property values due to removal of 44/69 kV line. Adverse effects to land use options due to easement restrictions.	Potentially significant adverse effect to property values due to the replacement of the 44/69 kV line with the larger 115 kV line. Easement to increase from 25 feet to 75 or 100 feet in width. Adverse effects to land use options within easement.
Sunshine Mesa – Norwood-Sunshine Alternative		
Length:	0.6 mile	0.6 mile
ROW requirements: (acres)*	1.4 to 2.8 acres	5.4 acres
*Construction Costs**:*	$1,054,099.00	$105,646.64
Life of the Project:	30 to 35 years	50 years
Ground Disturbance:	Approximately 1 acres for trench	Less than one acre
Geotechnical and Soils:	Moderate limitations – 0.1 mile Opportune areas – 0.5 mile	Low impacts or limitations in similar conditions due to potential avoidance of sensitive areas through pole spacing/placements.
Water Resources:	Trench would not directly impact any wetlands or water resources.	No direct or indirect impacts to wetlands or water resources.
Biological Resources – Vegetation Communities	Vegetation entirely removed along 5 foot wide trench (approx. 3.3 acres). Vegetation types removed would primarily be grasslands and forb rangeland. Minor amounts of aspen and Gambel oak would also be impacted.	Vegetation removed at pole sites. Same vegetation types would be affected as underground sub-alternative, although direct impacts to aspens would be largely avoidable through pole placements.
Visual Resources	Substantial beneficial effects. Beneficial effects would be long-term and include the removal (existing 44/69 kV line) and avoidance (of new 115 kV line) of impacts to scenic views from residential homes and ranches.	Substantial adverse effects. Adverse effects would be long-term and result from the installation of the 115 kV poles and conductors. Proposed project poles would be twice as large as existing 44/69 kV poles, resulting in increased visibility of the conductor as well. Same residential areas would be affected.
Land Use and Property Values	Substantial beneficial effect to property values due to removal of 44/69 kV line. Adverse effects to land use options due to easement restrictions.	Potentially significant adverse effect to property values due to the replacement of the 44/69 kV line with the larger 115 kV line. Easement to increase from 25 feet to 75 or 100 feet in width. Adverse effects to land use options within easement.

Notes:

* *Underground ROW assumed to be 20 to 40 feet wide. Overhead transmission line ROW assumed to be 75 feet wide.*

** *Costs for underground cable based on XLPE duct bank installation. Costs do not include ROW acquisition, engineering, increased maintenance or replacement costs due to shorter life of project. Costs for overhead transmission line are based on average costs of $176,077.74 per mile. Does not include costs for ROW acquisition or decreases in property values that may occur. Also does not include costs for undergrounding distribution lines or directional drilling costs, if required (see Appendix A-5).*

Increased Reliability in Telluride Area and Surrounding Communities. The proposed 115 kV transmission line would provide full back-up power and improved power reliability for all communities served by the Nucla-Telluride and Telluride-Hesperus lines, including Telluride, Mountain Village, Ophir, Silverton, Purgatory and Norwood. The reliability of the 115 kV line is estimated to be more than 99%. With respect to providing increased electric power reliability to the Telluride Area, all three DG alternatives would also improve the reliability of power in the Telluride Area over what exists today. The reliability of the DG alternatives would be less than the proposed 115 kV transmission line, however, and largely depend upon the generator's readiness to operate and the probability that the unit would start when signaled. For the Small and Emergency DG Alternatives, the reliability of the system would also depend on the rebuilt Nucla-Sunshine 69kV line. Industry statistics for industrial gas turbines in the 20 to 40 MW size class have an overall reliability record of 83% to 84%. None of the DG Alternatives could provide instantaneous backup power like the proposed 115 kV transmission system, however. Short blackout periods, up to 20 minutes, would occur with the DG alternatives during an emergency outage situation.

Table S-6
Comparison of Regional Benefits

	TOT2A Transfer Benefit	SW Colorado Load Serving Benefit
115 kV Nucla-Telluride Line	15 MW	30 MW
Large Distributed Generator Scenario	17 MW	11 MW
Small Distributed Generator Scenario	6 MW	4 MW
Emergency Generator Scenario	0 MW	0 MW

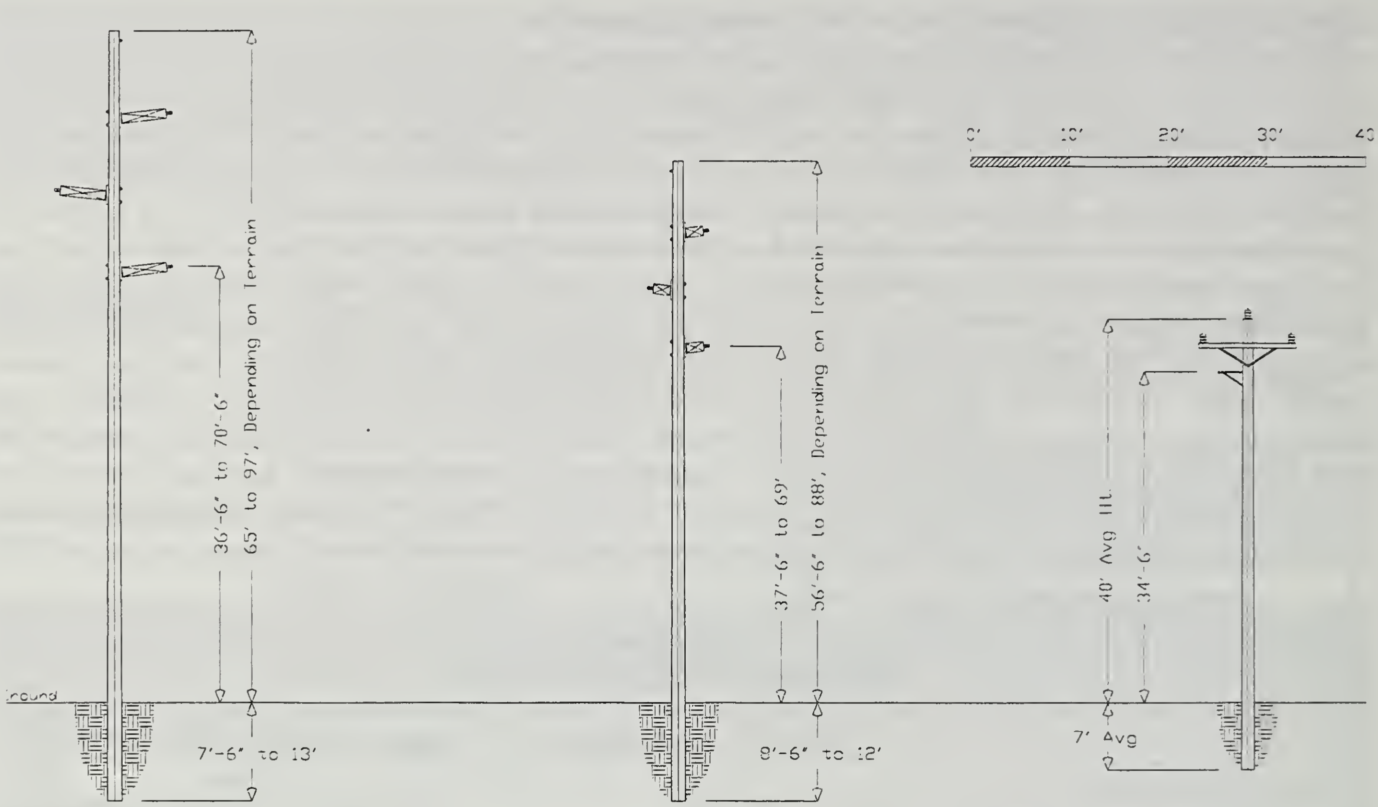
With the Large Generator scenario, customers on Specie and Wilson Mesas could continue to experience deteriorating electric service, and residents served by the Norwood Substation would also benefit less. This alternative could entail leaving the existing 69 kV transmission line in place for up to 10 years, converting it to a distribution line or removing it if distribution service is placed underground. Outages on this line would continue to be a reliability problem until the line was rebuilt to present-day standards. Customers served by the Nucla-Norwood 69kV transmission line would be on a 'radial' line with no source of backup power in the event there is an outage.

With the Small and Emergency Generator DG Alternatives, the existing 69 kV line would be rebuilt as a present-day 69 kV system between the Nucla and Sunshine Substations. Consequently, power reliability would improve in all areas served by the existing Nucla-Sunshine line, including Telluride, Mountain Village, Specie, Wilson and Sunshine Mesas and the Norwood/Wrights Mesa area.

Range and Type of Facilities Required. Tri-State's proposed Project would require:

- *A new 115 kV transmission line* supported on wood poles. Single, H-frame and three-pole designs would be used to support the 115 kV conductor and insulators. These poles would have an average height of 70 feet, approximately 14 feet taller than industry standard 69 kV structures (*see Figure SUMMARY-6*). The proposed poles would be almost twice as tall as the existing 69 kV line.

- *Improvements to SMPA's electrical system* including expansion of the Norwood Substation, minor modifications to the Nucla, Specie, Wilson Mesa, Sunshine or Telluride Substations, dismantling of the Oak Hill Substation, and modifications to distribution lines necessary to retain service to SMPA's customers.



115 kV Single Circuit Structure
Single Wood Pole – Tangent
Avg. Height: 70 ft.

69 kV Single Circuit Structure
Single Wood Pole – Tangent
Avg. Height: 56 ft. 5 in.

Existing 69 kV Structure
Single Wood Pole – Tangent
Avg. Height: 40 ft.

Figure SUMMARY-6
Comparison of Industry Standard Structures and Existing Nucla-Sunshine 69 kV Structure

The DG Alternatives would require the following types of facilities:

- ***Natural Gas Turbine Generators*** – ranging in capacity from 20 to 40 MW. The size of the generator(s) depends on whether the 13 MW of power from the Nucla-Sunshine line continues to be available. A GE Frame 6B generator is assumed for the Large Generator Alternative, while two Solar Titan 130 generators are assumed for the Small and Emergency Generator Alternatives. New or refurbished turbines could be used. Feasible sites 1.0 to 1.5 acres in size would be near the Telluride or Sunshine Substations or in other areas of Ilium Valley.
- ***A natural gas compressor station*** (1,100 hp) near or at Redvale
- ***An extension of the Kinder-Morgan 6" natural gas pipeline*** to the generator site. Length and location of the pipeline extension would depend on the generator site.
- ***Improvements to SMPA's electrical system*** – including rebuilding all or part of the Nucla-Sunshine 69 kV line to an industry standard 69 kV system. With the Large Generator Alternative, the line would be rebuilt only between the Nucla and Norwood Substations. The line would need to be completely rebuilt between Nucla and Sunshine for the Small and Emergency Generator Scenarios. The new 69 kV transmission line would be taller (56 feet, 5 inches average pole heights) than the existing 69 kV line (35 to 45 feet tall on average) ***(Figure SUMMARY-6)***. Other minor modifications would also be necessary at SMPA's substation facilities and to portions of their distribution system.

Major Environmental Tradeoffs. The proposed 115 kV transmission line would result in construction and operation-related impacts along the transmission corridor, at the Norwood and Sunshine or Telluride Substation sites, and where distribution lines are modified (*Tables S-1 and S-2*). The transmission alternatives would avoid, however, all impacts resulting from the DG Alternative's generation facilities, compressor station, and pipeline extension. Significant DG related impacts that would be avoided by the proposed transmission line project include increases in air emissions, visual impacts associated with the generators' stacks and inlet structures and vapor plumes; noise impacts from the generators, safety risks from ice fog; and visibility impairment impacts at Class I or II Wilderness Areas.

Major environmental issues associated with the DG Alternatives include:

- Increased air emissions from the generator(s) and compressor station, including increased amounts of NOx, SO, CO, and UHC. Impacts would vary depending upon the number of hours the generator(s) are operated annually.
- Visual impacts from a large generator or two small generators near Telluride. Generator stacks and inlet structures range from 25 feet to 50 feet in height for the small and large generator options.
- Visual impacts from the generator vapor plume during the winter. Visible vapor plumes could reach 100 feet in height.
- Safety risks from ice fog. Ice fog could affect both air and road travel conditions, given the proximity of potentially feasible sites to SR 145, South Fork Road and the Telluride Airport.
- Noise impacts from the generator(s). Noise impacts from the Large Generator scenario could exceed Colorado noise standards.
- Impaired visibility at Class I and II Wilderness Areas. Based on modeling studies conducted for the DG Alternatives, the potential for impaired visibility conditions exists at the Mount Sneffels, Big Blue and Lizard Head Class II Wilderness Areas. The Large Generator Alternative could also affect visibility conditions at La Garita and Weminuche Class I Wilderness Areas.
- Long-term visual and land use impacts associated with rebuilding the 69 kV line to a present day 69 kV system. The existing 45-foot tall wood poles would be replaced with poles averaging 56 feet, 5 inches in height. Impacts of rebuilding the 69 kV line would be substantially greater than the existing 69 kV transmission line.
- Short-term and long-term impacts to the natural, biological and cultural environments would also result from rebuilding the existing 69 kV line to a present-day 69 kV system. Impacts of rebuilding the 69 kV line would be very similar as reported in the EIS for the proposed 115 kV line.

Cost Comparisons: A comparison of the costs associated with the DG and Transmission Alternatives is illustrated in ***Figure SUMMARY-7***. Cost estimates for the DG Alternatives reflect options of using new (Full Price) or refurbished (w/Economies) generators. Estimates for the DG Alternatives do not include the infrastructure that would be necessary (e.g. natural gas pipeline extension, compressor station). Overall, the DG Alternatives are more costly than Tri-State's proposed 115 kV transmission line project. Should portions of the proposed transmission line be undergrounded across Beaver, Specie, Wilson and Sunshine Mesas, the costs of the proposed transmission line would be similar or greater than the DG Alternative, with total project costs being in the range of $29.3 to $32.7 million dollars.

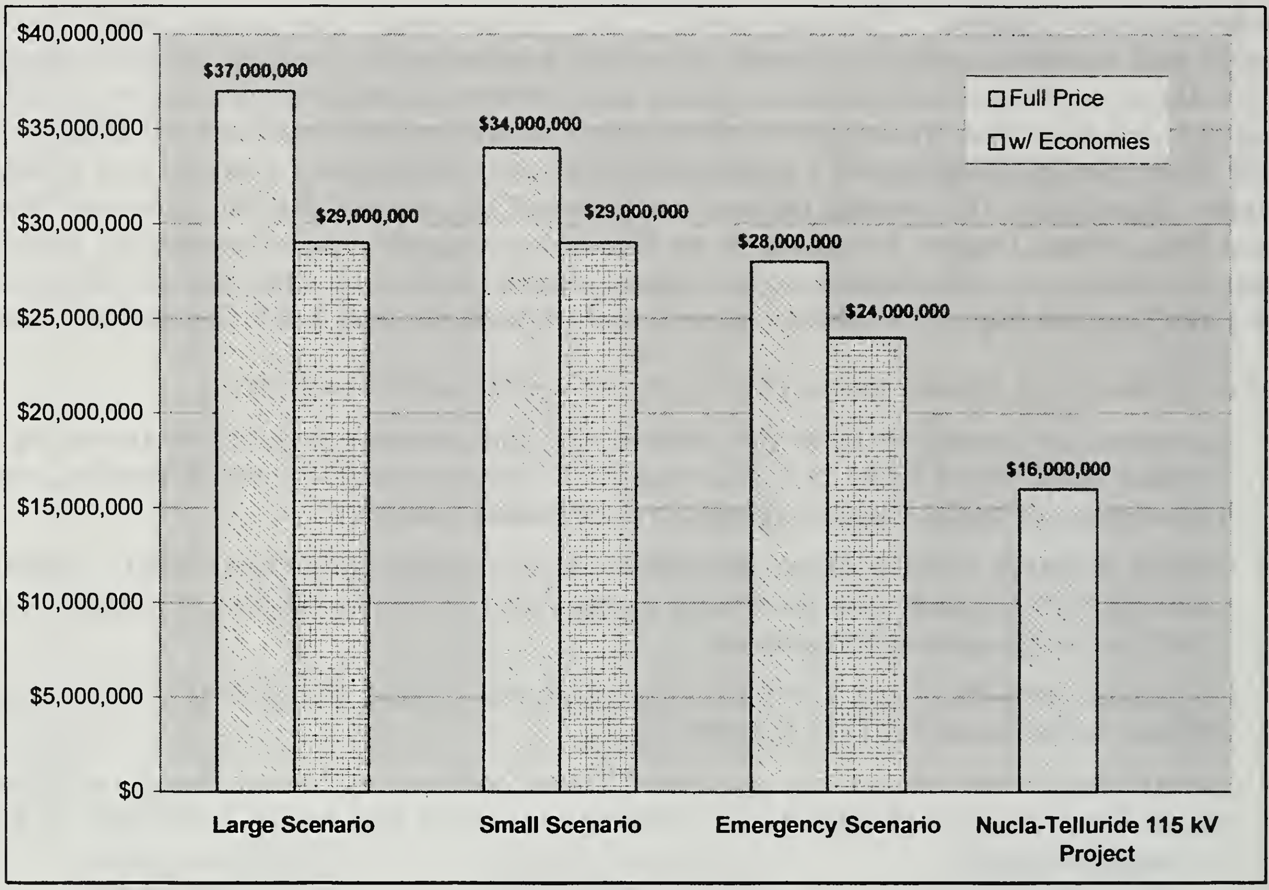


Figure SUMMARY-7
Comparison of Generator and Transmission Line Present Value Costs

FEDERAL DECISIONS TO BE MADE

ENVIRONMENTALLY PREFERRED ALTERNATIVE

In accordance with the provisions of NEPA C.F.R.§1502.14(e), this FEIS identifies the environmentally preferred alternative. Based on the EIS analysis and consideration of public comments on the DEIS, the environmentally preferred alternative consists of the following:

(1) Constructing and operating a new 115 kV line between the Nucla Substation and the Norwood Substation, along the Nucla-Norwood Central Alternative. With this alternative, the existing 69 kV line would be removed for most of its distance through agricultural and residential areas of Montrose County, except where small sections of line would be retained for distribution service. The new line would cross undeveloped public lands administered by the BLM and private lands where land uses are considered more compatible than found along the existing 69 kV line.

(2) Constructing and operating a new 115 kV line between the Norwood and Sunshine Substations using Subalternatives C and D. Between these substations, the environmentally preferred alternative consists of using both overhead and underground construction techniques. Undergrounding the line is environmentally preferable to overhead structures across portions of Beaver, Specie, Wilson and Sunshine Mesas due to the exceptional scenic quality that would be affected long-term by the taller overhead poles and conductors. The existing 69 kV line would be removed as part of this action alternative.

AGENCY PREFERRED ALTERNATIVE

The federal agencies' preferred alternative is a 115 kV transmission line project, located within the Nucla-Norwood Central Alternative and Norwood to Sunshine Alternative corridors. After considering public comments on the Draft EIS (FEIS, Vol. III), and releasing the FEIS, the Forest Service, BLM and RUS will issue Records of Decisions (RODs) regarding their respective decisions about whether to issue permits and approvals.

The **Forest Service** will decide whether to permit the proposed transmission line upgrade and, if so, where and under what conditions the Project may be constructed on lands administered by the National Forest System. The Grand Mesa, Uncompahgre and Gunnison National Forests Supervisor, Robert Storch, is the responsible official. The Forest Service decision will be documented in a Record of Decision (ROD).

The **BLM** will decide whether to issue a Right-of-Way Grant for the proposed transmission line upgrade and, if so, where and under what conditions the Project may be constructed on lands administered by the BLM. The Uncompahgre Field Office Manager, Allan Belt, is the responsible official. The BLM decision will also be documented in an ROD.

The **RUS** will issue a ROD based on the environmental, engineering and economic acceptability of the Project and decide whether to approve financing for the Project. The RUS decision centers around a review of the Project's technical and economic justification, reliability and environmental issues, and the location, in its entirety (federally managed lands and private property). Overhead structures across portions of Beaver, Specie, Wilson and Sunshine Mesas are acceptable and preferable regarding economics, repair difficulty, outage times, life of the Project, and certain environmental impacts related to ground disturbance, water resources and vegetation. Historically, RUS has not provided financing for rural underground transmission facilities. The RUS Administrator is the responsible official.

Concurrent with this federal process, San Miguel and Montrose Counties will consider Tri-State's Special Use Permit applications.

Chapter 1

Purpose and Need for Action

1 PURPOSE AND NEED FOR ACTION

1.1 INTRODUCTION

This Final Environmental Impact Statement (FEIS) documents the analysis of the environmental effects of constructing and operating a 115 kilovolt (kV) transmission line in southwest Colorado. Tri-State Generation and Transmission Association, Inc. (Tri-State) is proposing to replace and potentially relocate the existing Nucla-Sunshine 69 kV transmission line. The proposed transmission line would extend from the Nucla Substation at the Nucla Generating Station in Montrose County to either the Telluride or Sunshine Substations, in San Miguel County, Colorado. ***Figure 1-1*** shows the location of the existing 69 kV line and the potential substation interconnections.

Prior to constructing the Project, Tri-State must obtain approvals and permits from a number of federal, state and local agencies. Lands potentially affected by the proposed Project include public lands administered by the United States Department of Agriculture (USDA) Forest Service (Forest Service) and the United States Department of the Interior (USDI) Bureau of Land Management (BLM). Private lands in Montrose County and San Miguel County would also be affected, as well as lands administered by the State of Colorado. The USDA Rural Utilities Service (RUS) may provide financing for the Project since Tri-State is eligible for federal funding as a rural electric generation and transmission utility.

This FEIS has been prepared in accordance with the National Environmental Policy Act (NEPA) of 1969 and implementing regulations from the Council on Environmental Quality, the Forest Service, BLM and RUS. The Forest Service is serving as the federal lead agency in the preparation of this FEIS. The BLM and RUS are cooperating agencies under NEPA.

The FEIS reports the results of the Forest Service's independent assessment of the potential impacts of the proposed Project and alternatives. Alternatives evaluated in the FEIS include both locational variations for the placement of the 115 kV transmission line and alternative technologies. A primary purpose of the FEIS is to allow the Forest Supervisor, BLM Field Office Manager, and the RUS Administrator to consider the significant aspects of the environmental impacts of the alternatives discussed, in order that they may make informed decisions that will be documented in a Record of Decision (ROD). The FEIS also serves a primary purpose in fully disclosing to the public the environmental impacts of such decisions and of the alternatives considered. Specific decisions to be made by these agencies are described in Section 1.2. Finally, this FEIS documents the Forest Service's compliance with the National Environmental Policy Act (NEPA) (1969, as amended).

1.2 FEDERAL DECISIONS TO BE MADE

The Forest Service is the lead federal agency responsible for completing the EIS. The BLM and the RUS are cooperating agencies in this EIS.

After considering public comments on the Draft EIS (FEIS, Vol. III), and releasing the FEIS, the Forest Service, BLM and RUS will issue Records of Decisions (RODs) regarding their respective decisions about whether to issue permits and approvals.

The **Forest Service** will decide whether to permit the proposed transmission line upgrade and, if so, where and under what conditions the Project may be constructed on lands administered by the National Forest System. The Grand Mesa, Uncompahgre and Gunnison National Forests Supervisor, Robert Storch, is the responsible official. The Forest Service decision will be documented in a Record of Decision (ROD).

The **BLM** will decide whether to issue a Right-of-Way Grant for the proposed transmission line upgrade and, if so, where and under what conditions the Project may be constructed on lands administered by the BLM. The Uncompahgre Field Office Manager, Allan Belt, is the responsible official. The BLM decision will also be documented in an ROD.

The **RUS** will issue a ROD based on the environmental, engineering and economic acceptability of the Project and decide whether to approve financing for the Project. The RUS decision centers around a review of the Project's technical and economic justification, reliability and environmental issues, and the location, in its entirety (federally managed lands and private property). Overhead structures across portions of Beaver, Specie, Wilson and Sunshine Mesas are acceptable and preferable regarding economics, repair difficulty, outage times, life of the Project, and certain environmental impacts related to ground disturbance, water resources and vegetation. Historically, RUS has not provided financing for rural underground transmission facilities. The RUS Administrator is the responsible official.

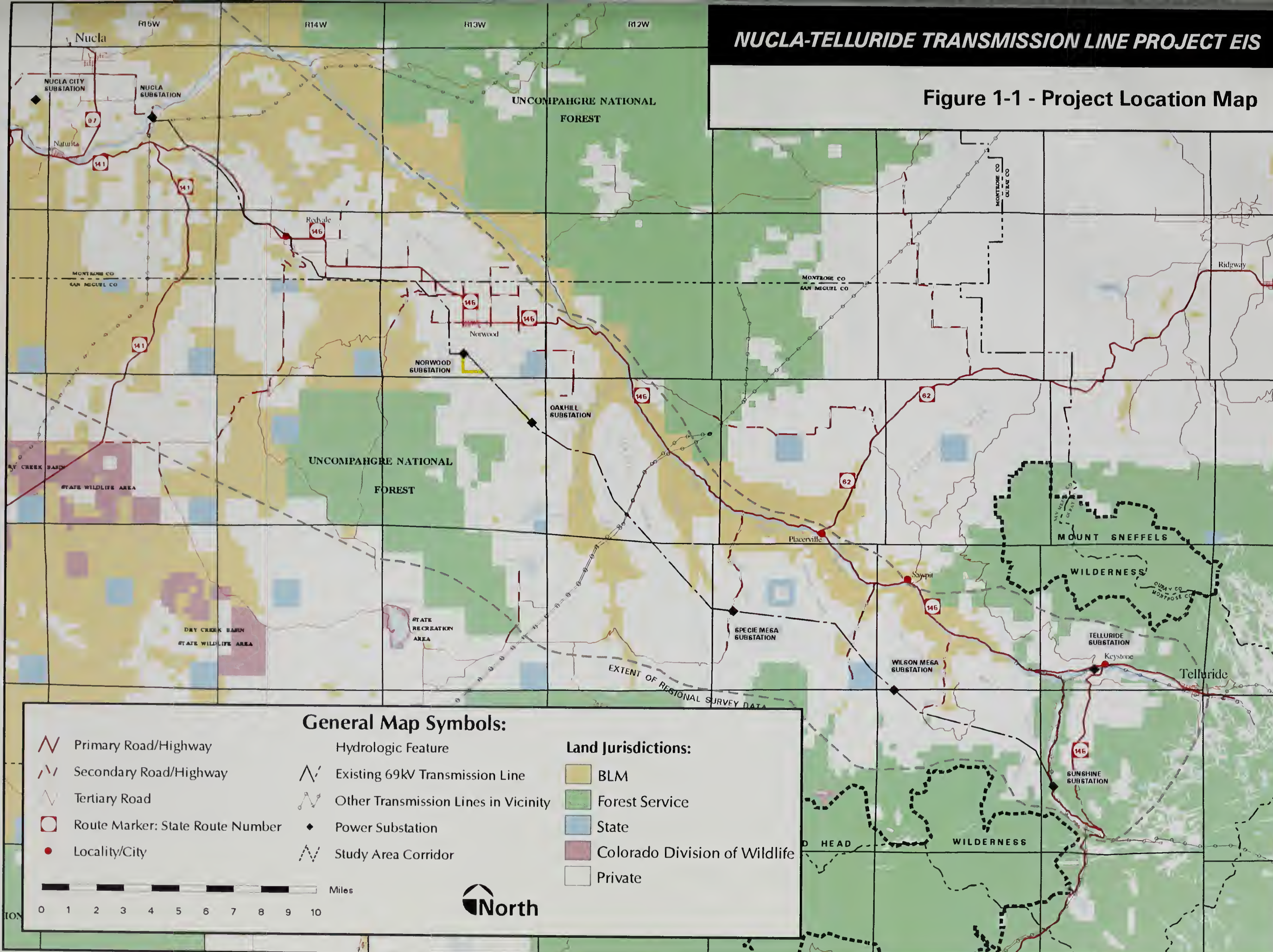
1.3 PERMITS AND APPROVALS

Prior to constructing the Project, a number of other federal, state and local permits and approvals would be required for the Nucla-Telluride Transmission Line Project, as indicated in *Table 1.3-1*, "List of Permits and Approvals."

Table 1.3-1
List of Permits and Approvals

FEDERAL GOVERNMENT	
U.S. Department of Agriculture Forest Service	EIS Approval-Record of Decision, Road Use Permit Special Use Permits Construction, Operation and Maintenance Plan
U.S. Department of Interior Bureau of Land Management	EIS Approval - Record of Decision Construction, Operation and Maintenance Plan Right-of-Way and Temporary Use Permits – transmission & fiber optics
U.S. Department of Agriculture Rural Utilities Service	EIS Approval-Record of Decision Plans and Specifications Review and Approval Approval of Financing
U.S. Department of Defense Army Corps of Engineers	Section 404 Permit (not anticipated)
U.S. Environmental Protection Agency	Spill Prevention Control and Countermeasure (SPCC) Plan Review of Section 404 Permit (not anticipated)
U.S. Department of the Interior Fish and Wildlife Service	Section 7 Consultation (informal anticipated)
Treasury Department Department of Alcohol, Tobacco, and Firearms	Explosives User Permit
STATE OF COLORADO	
Board of Land Commissioners	ROW Permit
Public Utilities Commission	Certificate for Public Convenience and Necessity
Colorado Department of Public Health Air Pollution Control Division	Permit to Construct Permit to Operate
Colorado Department of Public Health Water Quality Control Division	Storm Water Discharge Permit National Pollutant Discharge Elimination System (NPDES)
State Historic Preservation Office	Section 106 Compliance
Department of Transportation	Utility Crossing Permit
LOCAL GOVERNMENT	
Montrose County	Special Use Permit
San Miguel County	Building Permit Special Use Permit

Figure 1-1 - Project Location Map



Both **Montrose** and **San Miguel** Counties will decide whether to issue Special Use Permits for the proposed transmission line and, if so, where the Project will be located across private properties in these counties. The Montrose and San Miguel County Commissioners are responsible for decisions in their respective counties. In addition, site specific mitigation measures would be further detailed in the construction, operation and maintenance plan that Tri-State would be required to provide to the Forest Service and BLM as part of the permitting process.

It is important to note that the preparation of an EIS and the actual permitting of a project are related but distinctly separate actions. An EIS is designed to explore alternatives, mitigation measures, and to discuss environmental impacts. NEPA itself has no implementation authority. Tri-State's committed environmental protection measures and mitigation measures recommended in this EIS must be carried forward to the various permits to be effective in environmental protection.

All of the agencies with permitting authority for the Project have specific review requirements related to issuance of their respective permits. The federal government uses the implementing regulations for NEPA (40 CFR 1500). Both Montrose and San Miguel counties have a two step permitting process: Planning and Zoning (P&Z) Commission hearings and County Commissioners' hearings with decisions. Both processes are progressing concurrently for the Project.

1.4 PROPONENT'S PURPOSE AND NEED

Tri-State is a nonprofit, wholesale power supply cooperative that provides power to 44 members in Colorado, Nebraska, New Mexico and Wyoming. Tri-State was organized in 1952 by its member cooperatives. The organization is owned by the cooperatives and is guided by a 44-member board of directors - one director representing each of its members. San Miguel Power Association (SMPA) is one of the cooperative members and is also a nonprofit organization owned by the consumers it serves. SMPA provides power to approximately 10,000 customers spread across 3,800 square miles of southwestern Colorado. SMPA's service area, which encompasses portions of San Miguel, San Juan, Ouray, Montrose, Mesa, Hinsdale and Dolores Counties, is predominantly rural, serving approximately 6.7 customers for each mile of line.

Tri-State's mission is to provide a comparatively low-cost, reliable supply of power to its members to meet their short-term and long-term electrical power demands. To meet these demands, Tri-State has ownership and operating interests in five coal-fired plants -- the Craig, Nucla, Escalante, San Juan and Laramie River Stations. In addition, Tri-State receives an allocation of hydroelectric power from the Western Area Power Administration (WAPA). Power is transmitted to the cooperative members via more than 5,348 miles of transmission lines ranging from 115 kV to 345 kV, that Tri-State owns (wholly or jointly), operates and/or maintains. With the upgrade of the Nucla-Sunshine line from 69 kV to 115 kV, the ownership of this facility would be transferred from SMPA to Tri-State. ***Plate P&N -1*** shows the high voltage transmission and generation facilities in southwestern Colorado.

The Nucla-Telluride 115 kV Transmission Line Project is being proposed by Tri-State for the following reasons:

- To alleviate regional system overloads and inefficiencies that are presently occurring in southwestern Colorado;
- To provide a long-term source of reliable power for the Telluride area;
- To improve the quality of service in a number of communities including Telluride, Norwood, Rockwood, Purgatory and Silverton; and
- To increase the load-serving capacity of the transmission system in southwest Colorado.

1.4.1 BACKGROUND

The high voltage transmission network within southwestern Colorado is shown in ***Plate P&N-1***, "Existing Transmission System." The existing Nucla-Sunshine 69 kV line is 45 miles long and was originally constructed in 1948 as a 44 kV line. The line was later upgraded to 69 kV, providing a capacity of 13 megawatts (MW) of power. The Nucla-Sunshine 69 kV line is owned and operated by San Miguel Power Association (SMPA). SMPA is one of Tri-State's owner, member cooperatives.

Historically, the Nucla-Sunshine 69 kV line has been operated to provide reliable power to SMPA's customers. The 69 kV line has been the primary source of power for a number of communities including Norwood, Redvale, and residents of Wrights, Wilson, Sunshine and Specie Mesas. The Nucla-Sunshine line has also been a backup source of power to the Telluride Area. The Telluride Area is principally served by the Hesperus-Telluride 69/115 kV line (***Plate P&N-1***). However, in instances when the Hesperus-Telluride line has been out of service due to either scheduled maintenance or emergency repairs, SMPA has been able to maintain power in the Telluride Area with the Nucla-Sunshine 69 kV line.

The reliability of power to the Telluride, Norwood and Wrights Mesa areas has been diminishing in recent years, however, due to a number of factors. The Nucla-Sunshine 69 kV line has sustained 50 years of normal use and deterioration. Although the transmission line has received appropriate maintenance to date, the annual cost of keeping this equipment operating safely is growing. The declining reliability of the Nucla-Sunshine line can also be attributed to its design, which does not meet present-day utility industry standards for 69 kV lines. A major design limitation of the existing line is the lack of an overhead shielding wire. An overhead shielding wire provides protection from lightning strikes. The absence of an overhead shielding wire has resulted in numerous customer outages in local communities when lightning strikes occurred in this area.

Local reliability to Telluride is further compromised by the terrain and weather conditions to which the Hesperus-Telluride line is exposed. The Hesperus-Telluride line is 79 miles long and is routed over mountainous, rugged terrain including Ophir, Molas, and Coal Bank Passes. These mountain passes routinely experience severe winter weather that includes heavy snowfall, high winds and sub-zero temperatures. These factors result in the Hesperus-Telluride line being at greater risk for an outage than most 115 kV transmission lines. The location and possible severe weather conditions also increase the difficulties related to the prompt restoration of the Hesperus-Telluride line. Wind and ice during storms create major threats to electric facilities, and when damage occurs it is often difficult and dangerous, if not impossible, to make repairs until weather conditions improve. Because of difficulties maintaining the Hesperus-Telluride line, most maintenance on the Hesperus-Telluride line can only occur while that line is de-energized.

The reliability record of the Nucla-Sunshine 69 kV line and the Hesperus-Telluride 69/115 kV lines are summarized on *Table 1.4-1*. It should be noted that while most outages have been of a short-duration, lasting only minutes, durations of outages for both lines have lasted several hours in some instances. Under worst case conditions, an outage on the Hesperus-Telluride line in severe winter conditions could last several days causing extended or rolling blackouts to over 3,000 customers.

Until recently, the 13 MW capacity of the Nucla-Sunshine 69 kV line was sufficient to provide backup power to the Telluride area in instances when the Hesperus-Telluride line is out of service. The Nucla-Sunshine 69 kV line will not be able to provide adequate backup power for the Hesperus-Telluride line in the future, however, due to both load growth and increased maintenance requirements. Consequently, Tri-State believes the proposed 115 kV transmission line is necessary to provide sufficient backup power for the foreseeable future.

Table 1.4-1 Transmission Line Outage Histories		
	115/69 kV Hesperus-Telluride	69 kV Nucla-Sunshine
Historical Time Period	1993 to 1997	1993 to 1997
Total No. of Unscheduled Outages	41	75
Total Outage Duration for Period	10 hrs. 50 min.	29 hrs. 39 mins.
Average No. of Outages per Year	10	19
Average Outage Duration	16 min.	24 min.
Average Total Outage Duration per Year	2 hrs. 43 min.	7 hrs. 25 min.
Longest Outage Duration	2 hrs. 34 min.	15 hrs. 29 min.
Next Longest Duration Outages	2hrs. 17 min. 1 hr. 47 min. 1 hr. 43 min.	3 Outages totaling 11 hrs. 31 min.
Source: Tri-State 2000		

1.4.2 ALLEVIATING REGIONAL SYSTEM OVERLOADS

The regional southwestern Colorado power system (***Plate P&N -1***) extends between Montrose and the Colorado/New Mexico border and includes the service territories of three of Tri-State's cooperative members: Empire Electric Association (Empire), LaPlata Electric Association (LaPlata) and SMPA. This regional transmission system is operated for two primary purposes: to reliably serve the existing and projected loads in the region; and to provide bulk power transfers through the region, that assure regional reliability and the economical operation of the system. ***Figure 1-2*** shows the current and future demands of the region by cooperative member. The transmission capacity of the regional system, called TOT.2A[1], is 690 MW (Tri-State 2001). Of this capacity, 420 MW is allocated to the Western Area Power Administration to meet their obligations in New Mexico and Arizona, including the Salt River Project's ownership of generation at the Craig and Hayden Generating Stations. The remaining 270 MW of capacity is shared by Public Service Company of Colorado and Tri-State. This capability is first utilized by Tri-State to serve net load[2] in southwestern Colorado, which can range from approximately 120 MW to 200 MW on peak.

Power system planning for the region, including long-term power demand projections and system performance, is coordinated through the Western Systems Coordinating Council (WSCC). The WSCC is composed of a number of utilities that establish operating guidelines and standards for regional transmission systems reliability. Power flow studies conducted by Tri-State for the WSCC in the mid-1990s concluded that inadequate operating conditions could occur in the future, including low voltages and system overloads. The studies found low voltages at the Cascade, Rockwood and Pagosa Springs Substations and overloading on the

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[1] *TOT.2A is the amount of power that can be transmitted across the Colorado-New Mexico State Line. This "total" is calculated by summing the flows on the three transmission lines that cross the state line. A related measure named TOT.2á is the total of the power flowing from Montrose and Curecanti Substations into southwest Colorado. TOT.2á is a more-easily defined capability than TOT.2A because it is less affected by local conditions.*

[2] *"Net" Load in southwest Colorado is the sum of the loads in the area minus generation in the area. "Local" Generation includes Nucla, Ames, Tacoma, and other small hydroelectric stations.*

Nucla-Cahone 115 kV line. These conditions reflect the fact that the existing regional system is unable to simultaneously meet both peak load demands and regional transfer requirements without violating industry performance standards. Transmission line overloads will increase as growth occurs in the region (Tri-State 1999j).

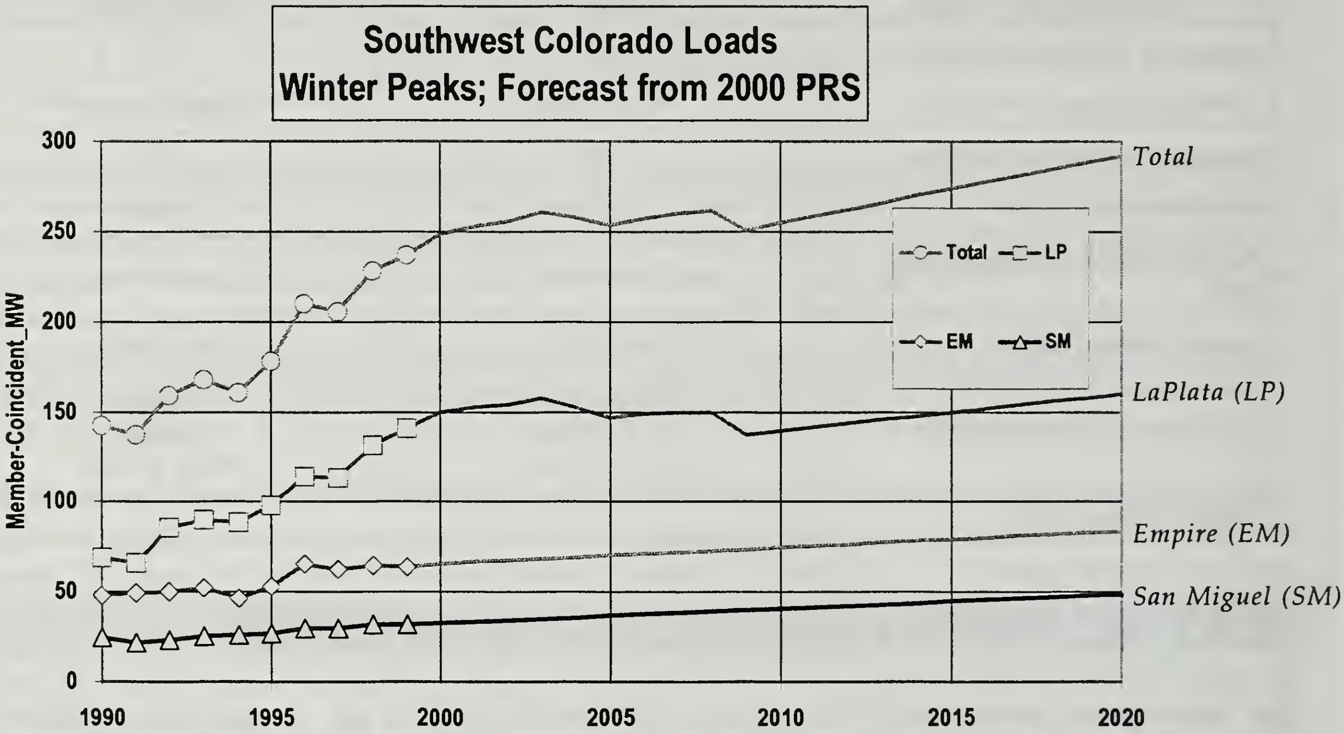

Figure 1-2
Southwestern Colorado Load Growth Projections by Member

In order to meet the long-term regional load growth demands and bulk power transfer requirements of WSCC, a number of system modifications are planned by Tri-State, including the proposed Nucla-Telluride 115 kV Project. Other related projects and their time frames for implementation are:

- reconductoring the Durango-Lost Canyon 115 kV line (2001)
- uprating the existing Nucla-Cahone 115 kV line (2002/2003)
- reconductoring the Montrose-Nucla 115 kV line (2002/2003)
- adding capacitors at a number of existing substations in southwestern Colorado (2004)
- adding transformers at the Hesperus and Lost Canyon Substations (2002)

The Nucla-Telluride project is addressed separately, however, due to the need to remedy power reliability problems in the Telluride Area. The Nucla-Cahone 115 kV line overloads during times of heavy local loads and high north-to-south regional power transfers when the Montrose–Hesperus 345 kV line is opened. The existence of a third 115 kV exit path for the power generated at Nucla would significantly reduce the loading on this line (***Plate P&N-1***). Furthermore, the proposed transmission line would provide a complete 115 kV loop between Nucla and Hesperus Substations, thereby providing an alternative energy path during periods of high system use and overload conditions.

Presently, overloading of the Nucla-Cahone 115 kV line is prevented by limiting Nucla Generation. The Nucla Station is designed and permitted to produce 100 MW of power. The power plant normally produces 80 MW of power with 20 MW of spinning reserve. In recent

years, power production has been limited to 65 MW for three months during the summer to prevent excessive thermal sag limits of the Nucla-Cahone 115 kV line. The proposed Project would remove this three-month production limitation by providing an additional path for transmission power from the power plant.

As noted above, the Nucla-Cahone 115 kV line is scheduled to be uprated in 2002. This, in combination with the proposed Nucla–Telluride 115 kV line, will raise the thermal sag limit of the Nucla-Cahone 115 kV line to an acceptable level. However, if the Nucla–Telluride 115 kV line is not constructed, then the Nucla-Cahone 115 kV line will have to have a larger conductor installed, in addition to being uprated, at an additional cost of about $2 million.

1.4.3 RELIABLE POWER FOR TELLURIDE AREA

The present operating configuration of the system serves loads from two separate radial lines. Loads between Hesperus and Telluride are served by the 79-mile radial 115 kV line; while loads between Nucla and Sunshine are served from the 45-mile radial 69 kV line. These two systems are normally isolated from one another by an open switch at the Sunshine Substation. In the past, the switch at Sunshine could be closed during emergencies, providing mutual backup for the two loads. But load growth in the Telluride area has exceeded the capability of the Nucla and Sunshine 69 kV line except during periods of low loads. However, with the proposed 115 kV path between Hesperus and Nucla, a single outage on either line could occur without disrupting service to the Telluride Area. During peak loads the proposed 115 kV line would be able to serve the area radially from Nucla, without violating WSCC voltage criteria.

Southwestern Colorado, particularly the Telluride area, has been experiencing a trend of increasing power demand due to growing population and the related tourism industry. SMPA's future demand estimates for the Telluride area include the population and users served from the Norwood, Oak Hill, Specie Mesa, Wilson Mesa, Sunshine, Telluride and Cement Creek Substations. Demand in this part of SMPA's service area has grown at a rate of 1.4 MW per year (Tri-State 2001). Most of this growth is attributable to the immediate vicinities of Telluride and Mountain Village. (SMPA Power Requirement Study 1998). *Table 1.4-2* summarizes SMPA's projected annual and peak summer and winter loads to the year 2030.

Figure 1-3 shows the historical and projected demand for power during peak winter periods for SMPA's service territory and the Telluride area between 1992 and the year 2020. Between 1992 and 1998, the loads for the Telluride area have been approximately 68% of SMPA's total demand. The existing peak load within SMPA's service area typically occurs during the winter, and reached 32 MW in 1999. Projected demand for the entire SMPA service area is estimated by SMPA to reach 45 MW in the year 2015 (Tri-State 2001).

The Hesperus-Telluride 69/115 kV transmission line provides the primary power source to the Telluride area, and will continue to be the primary power source in the future. At present, the Hesperus-Telluride transmission line can deliver 25 MW when the Ames Power Plant is operating and 20 MW when Ames is not operating. The Ames Power Plant is owned and operated by Public Service of Colorado. With the addition of capacitors at the Cascade Substation, the Hesperus-Telluride line will be able to deliver approximately 32 MW of power (AESC 2000). With these on-site substation modifications, the Hesperus-Telluride 115 kV line will have adequate capacity to continue to serve as the primary source of power for the Telluride area for the foreseeable future. However, Tri-State believes a second 115 kV transmission loop service line is needed to ensure reliable power, as well as WSCC Reliability Criteria, to withstand a single contingency outage.

Table 1.4-2
San Miguel Power Association
Projected Annual and Peak Loads

YEAR	ENERGY ANNUAL *Gwh*	MCP PEAK SUMMER *MW*	MCP PEAK WINTER *MW*
1999	158	20.3	32.4
2000	163	20.5	33.0
2001	163	24.8	33.7
2002	167	25.3	34.3
2003	170	25.8	35.1
2004	174	26.4	35.9
2005	178	27.0	36.7
2006	182	27.6	37.5
2007	186	28.2	38.3
2008	190	28.9	39.1
2009	194	29.5	39.9
2010	198	30.1	40.7
2011	202	30.7	41.5
2012	206	31.3	42.3
2013	210	31.9	43.1
2014	214	32.5	43.9
2015	218	33.1	44.7
2016	222	33.8	45.5
2017	226	34.4	46.3
2018	230	35.0	47.1
2019	234	35.6	47.9
2020	238	36.3	48.7
2021	242	36.9	49.5
2022	246	37.5	50.4
2023	250	38.1	51.1
2024	254	38.7	52.0
2025	258	39.4	52.8
2026	262	40.0	53.6
2027	266	40.6	54.4
2028	270	41.2	55.2
2029	274	41.8	56.0
2030	278	42.5	56.8

Source: 2000 Power Requirements Study

As noted earlier, the Hesperus-Telluride transmission line is routed over rugged mountain terrain. Severe winter conditions of heavy snowfall, high winds and sub-zero temperatures, combined with several known avalanche areas, create hazards for this line; and the potential for outages is significant. An outage along a portion of the Hesperus-Telluride Transmission Line would cause an outage in Telluride. An outage during the peak winter season could last several days and pose significant risks, as well as inconveniences, to the community. Medical support in Telluride would be severely curtailed during an outage, and could pose a risk to human life and safety. Communications and travel in and out of Telluride at the Telluride Airport would also be limited during an extended outage. During an extended outage, the Telluride Ski Area would lose service, potentially shutting down the ski area (SMERG 1999). Due to these conditions, the need for a reliable back-up source of power is considered critical by Tri-State.

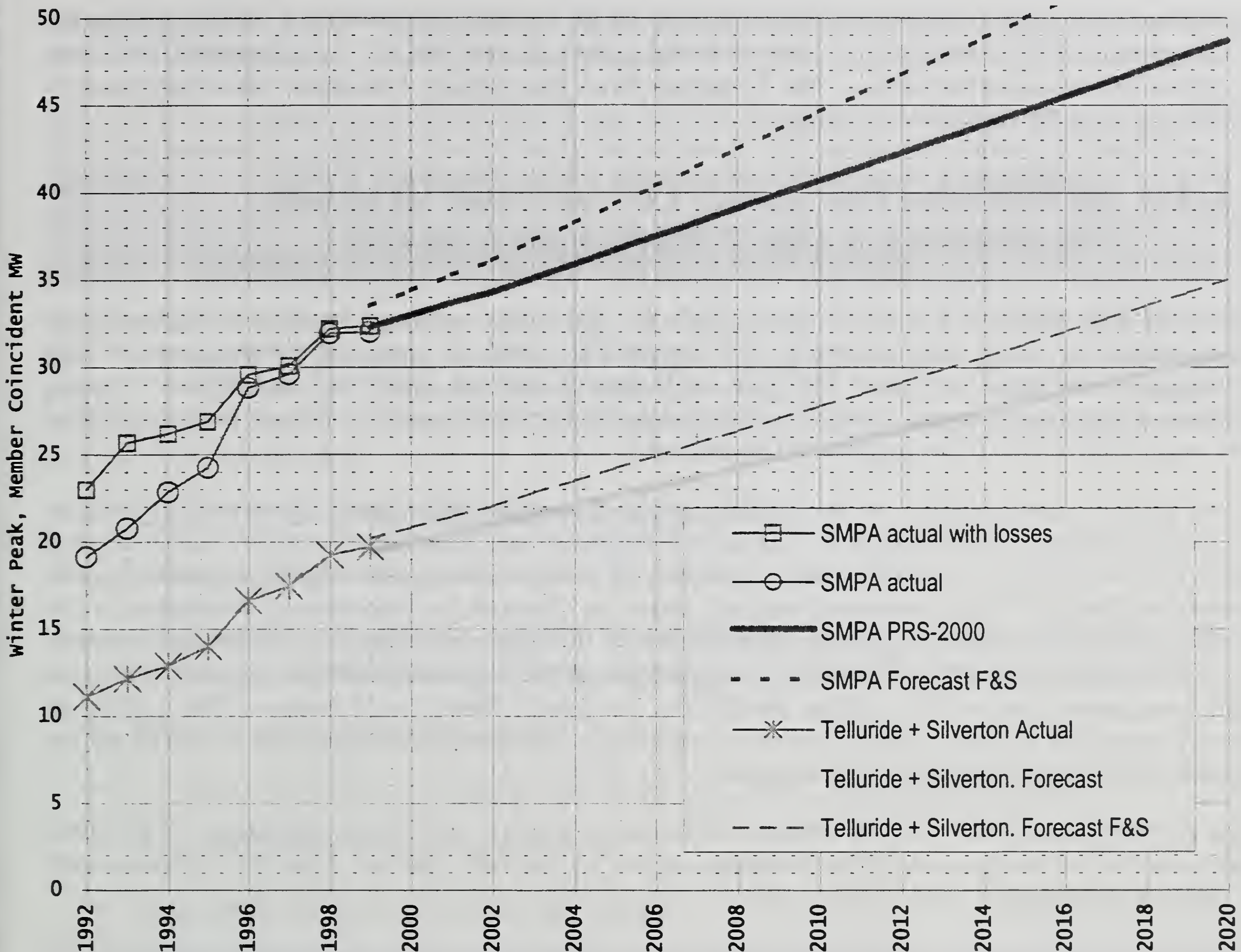

Figure 1-3
Telluride Area Loads

The Telluride Area includes Norwood, Oak Hill, Specie Mesa, Wilson Mesa, Sunshine, Telluride, and Cement Creek Substations.

PRS – Power Requirement Study
F&S – PRS-2000 projection with Growth and Severe Weather

The existing Nucla-Sunshine 69 kV line has historically provided back-up reliability to the Telluride area when the Hesperus-Telluride line is not operating due to either scheduled maintenance on unscheduled outages. The Nucla-Sunshine 69 kV line has a normal operating capacity of 13 MW.[3] Due to load growth in the last five years, the Nucla-Sunshine line is no longer adequate to back up the Hesperus-Telluride 115 kV line during peak winter loads. In 1999, peak winter loads exceeded 22 MW (Tri-State 2001). As discussed earlier, the 50-year age and substandard design of this facility also greatly affects its ability to serve as a backup source of power in the future.

[3]The existing 69 kV line has a capacity of 13 MW when operated to meet RUS reliability criteria of maintaining voltages between 0.95 and 1.05. The Nucla-Sunshine 69 kV line can support a load of up to 26 MW if voltages are allowed to drop to 0.90. This can be done only in short-term emergency situations, lasting no longer than 20 minutes in duration, however. (Tri-State, 2001)

The proposed Nucla-Telluride 115 kV line would be capable of providing 55 MW of power. This upgrade would consequently provide adequate capacity for full backup to the Telluride Area for the foreseeable future. The Telluride Area (Norwood, Telluride, Silverton) load is projected to be 30 to 32 MW in 2015.

1.4.4 IMPROVING THE QUALITY OF SERVICE TO LOCAL COMMUNITIES AND SURROUNDING AREAS

Tri-State has adopted the WSCC standards for adequate voltage levels on high voltage transmission systems. These criteria, which meet RUS funding approval criteria, require that voltages be between 0.95 and 1.05 per unit during normal operating conditions. During abnormal conditions, when a transmission line or transformer is out of service, voltages can be between 0.90 and 1.10 per unit for a limited time.

A number of communities within southwestern Colorado have been experiencing voltage related problems. Low voltages at Cascade, Rockwood and Pagosa Substations occur during peak load conditions and high system transfers. These conditions would be remedied by the proposed Project. Other communities that could be affected by low voltage problems in the future include Norwood, Purgatory and Silverton. Inadequate voltage can result in a number of problems such as reduced television reception, and the malfunctioning of electronic devices and computers due to low voltage levels. The proposed Project will improve the quality of power provided to these communities by ensuring that adequate voltage levels can be maintained within the overall system.

The performance history of the Hesperus–Telluride 115 kV and Nucla–Sunshine 69 kV lines ranks as two of the poorest in the Tri-State region. Combined, the two lines have experienced a total of 116 outages from 1993 to 1997.

1.4.5 INCREASED CAPACITY OF THE TRANSMISSION SYSTEM

The proposed Nucla-Telluride 115 kV line would have the desirable effect of allowing power to flow from the Nucla Substation into the Durango area by way of the existing Telluride-Hesperus 115 kV line. One measure of this benefit is the effect on the transmission system's ability to serve load. The proposed Nucla-Telluride 115 kV line would cause the load-serving capacity in the southwest Colorado region to increase from about 200 MW, depending on various conditions, to about 230 MW. This benefit applies to the customers of La Plata and Empire Electric Associations, as well as to San Miguel Power Association (Tri-State 2000d).

1.5 PUBLIC PARTICIPATION PROCESS AND ISSUES

1.5.1 SCOPING AND IDENTIFICATION OF ISSUES AND CONCERNS

In accordance with NEPA (40CFR 1501.7), the Forest Service held a number of public scoping meetings to document the issues associated with this Project and the scope of the EIS analysis. The Notice of Intent (NOI) was published in the Federal Register on April 30, 1998. Workshops and meetings were noticed and held on February 24, 25, March 19, May 26, 27, 28 and August 19, 1998. In addition to the public scoping meetings held for the EIS, a number of meetings were hosted in 1999 by the San Miguel Energy Resource Group (SMERG). Input from the public meetings and written comments were evaluated and considered in determining the scope of the EIS, including issues and alternatives. Issues raised during scoping were used to focus the scope

of the EIS analysis, which is presented in Chapter 3.0. Alternatives raised by the public were also considered, as described in Chapter 2.0, and include both locational and technology options.

Table 1.6-1 is a summary of the major social and environmental issues raised during scoping. The table also serves as a guide to the EIS reader on where to find relevant information on the issues in this EIS.

1.5.2 COMMENTS RECEIVED ON THE DRAFT EIS

The public review period for the Draft EIS extended between March 31, 2001 and May 30, 2001. A total of 85 comment letters and e-mails were received during the public review period. A summary of the issues, along with the responses to the individual comments is contained in Volume III of the FEIS. Issues raised during the comment period included the following general topics:

- Impacts to landscape aesthetics and scenic quality
- Land use compatibility and impacts to property values
- Comparative effects and costs of undergrounding versus overhead construction, including comments and questions regarding Tri-State's Undergrounding Policy
- Purpose and need for the project
- Potential impacts to biological resources, wetlands, and water resources
- Potential indirect effects of wildfires
- Impacts of DG Alternatives on air quality
- Range of Alternatives including routing alternatives, alternative technologies, distributed generation options, and conservation methods
- Accuracy and adequacy of the EIS analysis

Each of these issues is discussed in Volume III of the FEIS. Based on comments received on the DEIS, text and map changes have also been made where appropriate to reflect updated information, clarifications or corrections.

Table 1.6-1
Summary of Scoping Issues and EIS Readers' Guide

Summary of Public Comments/Issues	EIS Guide – Where to Find Issue Analysis and Related Information
Climate and Air Quality	
Potential effects of the Project and alternatives on air quality and the Telluride Area's nonattainment status for PM 10 under the Clean Air Act.	Chapter 3, Section 3.2 Climate and Air Quality
Potential air quality/visibility impacts to Class I and II wilderness areas.	Chapter 3, Section 3.2 Climate and Air Quality
Potential effects of severe winter conditions on power outages, emergency repairs, response times and access conditions.	Chapter 1, Purpose and Need Chapter 3, Section 3.14 Human Health and Safety; Section 3.12 Transportation
Natural Resources - Geology, Paleontology, Minerals, Soils and Water	
Geologic hazards exist in the Project area, including areas subject to avalanches, landslides and unstable slopes along the San Miguel River. Project construction could further increase these hazards, particularly in areas of steep slopes, due to the activities of construction equipment and vehicles.	Chapter 3, Section 3.3 Geology, Paleontology and Minerals, Section 3.4 Soils, Section 3.5 Water Resources Table 2.2-4 and Table 2.2-5, Committed Mitigation Measures
Scientifically important geologic formations that contain nonrenewable paleontological fossils or minerals of commercial value may be impacted.	Chapter 3, Section 3.3 Geology, Paleontology and Minerals
Potential impacts to the San Miguel River and other waterways (S. Fork of the San Miguel River, Naturita Creek) from sedimentation and soil erosion	Chapter 3.0, Section 3.4 Soils, Section 3.5 Water Resources, Section 3.6 Biological Resources Table 2.2-4 and Table 2.2-5, Committed Mitigation Measures
Protection of the San Miguel River Basin, in accordance with the goals established by the San Miguel River Basin Resource Planning Group	Chapter 3.0 Section 3.6 Biological Resources and Section 3.8 Land Use
Potential impacts to wetlands in canyon bottoms where riparian habitats are found	Chapter 3.0, Section 3.5 Water Resources, Section 3.6 Biological Resources Chapter 2.0, Table 2.2-4 and Table 2.2-5, Committed Mitigation Measures
Potential impacts to water quality from construction activities and vehicles, including road building, vehicle maintenance and fueling	Chapter 3.0, Section 3.5 Water Resources Chapter 2.0, Table 2.2-4 and Table 2.2-5, Committed Mitigation Measures
Potential water consumption and source of water	Chapter 2.0, Alternatives including the Proposed Action Chapter 3.0, Section 3.5 Water Resources
Natural Resources – Vegetation Communities, Wildlife Habitat, Sensitive Species	
Potential impacts of transmission right-of-way clearing on old growth forests and conifers	Chapter 3.0, Section 3.6 Biological Resources
Habitat fragmentation resulting from new roads and right-of-way clearing	Chapter 3.0, Section 3.6 Biological Resources
Potential impacts to bird habitats, including ponds and wetlands	Chapter 3.0, Section 3.6 Biological Resources, Section 3.5 Water Resources

Table 1.6-1 **Summary of Scoping Issues and EIS Readers' Guide**	
Summary of Public Comments/Issues	**EIS Guide – Where to Find Issue Analysis and Related Information**
Potential impacts to sensitive species such as the Gunnison Sage Grouse due to raptors perching on transmission poles	Chapter 3.0, Section 3.6 Biological Resources
Potential impacts to raptors, resulting from powerline collisions and electrocutions, particularly along canyons frequented by raptors for hunting	Chapter 3.0, Section 3.6 Biological Resources Chapter 2.0 Table 2.2-4 and 2.2-5, Committed Mitigation Measures
Potential impacts to wildlife species due to the presence of construction activities, equipment and noise during breeding seasons or in sensitive habitats.	Chapter 3.0, Section 3.6 Biological Resources Chapter 2.0 Table 2.2-4 and 2.2-5, Committed Mitigation Measures
Cultural Resources – Archaeological and Historic Sites	
Potential impacts to, and avoidance of, cultural resources of historic and pre-historic value	Chapter 3.0, Section 3.7 Cultural Resources
Ensuring surveys and data recovery are performed in a manner that adds to the body of knowledge in the region.	Chapter 3.0, Section 3.7 Cultural Resources and Chapter 2.0, Table 2.2-4 and 2.2-5, Committed Mitigation Measures
Social Issues – Compatibility with Private Property Uses, Community Economic Issues, Conformity of Adopted Plans and Policies, Visual Effects, Public Recreation and Human Health and Safety Risks	
Potential impacts to irrigated agriculture, irrigation systems and operations.	Chapter 3.0, Section 3.8, Land Use
Consolidation of infrastructure and utilities in places already disturbed, such as along existing roads and land use boundaries	Chapter 2.0, Alternatives Including the Proposed Action Chapter 3.0, Section 3.8 Land Use and Section 3.12 Transportation
Compatibility of the Project with residential homes and subdivisions	Chapter 3.0, Section 3.8 Land Use, Section 3.10 Visual Resources, Section 3.13 Noise, Section 3.14 Human Health and Safety
Impacts to public and private recreation areas and natural preserves (e.g. the Nature Conservancy Preserves and the BLM's ACEC)	Chapter 3.0, Section 3.8 Land Use and Section 3.9 Recreation
Concerns regarding fragmentation of private land and future land use options	Chapter 3.0, Section 3.8 Land Use
Potential visual impacts to public scenic views, including views from the San Juan Skyway Scenic Byway, the Unaweep Tabeguache Scenic Byway, public BLM and National Forest lands used for recreation, and designated scenic viewpoints.	Chapter 3.0, Section 3.10 Visual Resources, and Section 3.9 Recreation
Potential visual effects to heavily traveled recreation roads.	Chapter 3.0, Section 3.8 Land Use and Section 3.10 Visual Resources
Potential visual impacts to private landowners and residents	Chapter 3.0, Section 3.8 Land Use, Section 3.10 Visual Resources and Section 3.11 Socioeconomics
Potential long line-of-sight views to powerline, and views to ridgeline crossings	Chapter 3.0, Section 3.10 Visual Resources

Table 1.6-1
Summary of Scoping Issues and EIS Readers' Guide

Summary of Public Comments/Issues	EIS Guide – Where to Find Issue Analysis and Related Information
Protection of the San Miguel River corridor and Naturita Canyon from negative visual effects	Chapter 3.0, Section 3.10 Visual Resources
Use of vegetation screening to minimize the visual effects of the transmission line	Chapter 3.0, Section 3.10 Visual Resources, Section 3.6 Biological Resources
Potential impacts of the transmission line on private property values due to land fragmentation or loss of scenic quality	Chapter 3.0, Section 3.8 Land Use, Section 3.10 Visual Resources and Section 3.11 Socioeconomics
Potential impacts of the Project on public health due to exposure to electric and magnetic field effects	Chapter 3.0, Section 3.14 Human Health and Safety
Does the Project conform with the County and Federal land use plans?	Chapter 3.0, Section 3.8 Land Use
Potential impacts of not having reliable power on the local economy and businesses	Chapter 1.0 Purpose and Need, Chapter 3.0, Section 3.11 Socioeconomics
Effects of unreliable power on Telluride's tourism	Chapter 3.0, Section 3.11 Socioeconomics
Transportation, Traffic and Access-Related Issues	
Access Issue – Will new roads be built and where?	Chapter 2.0 – Alternatives including the Proposed Action, Chapter 3.0, Section 3.12 Transportation
Potential effects of new or improved access roads, including increased dust, soil erosion, noise, disturbances to wildlife and cumulative changes to undeveloped areas (e.g. Naturita Canyon)	Chapter 3.0 – Section 3.2 Climate and Air Quality, Section 3.4 Soils, Section 3.13 Noise, Section 3.6 Biological Resources, Section 3.8 Land Use and Section 3.9 Recreation
Alternatives – Siting and Technology Options	
Placement of the line away from homes, subdivisions, public recreation areas, designated scenic areas, sensitive wildlife areas, undeveloped natural areas where new access would be required.	Chapter 2.0 – Alternatives including the Proposed Action (See Alternatives Considered and Eliminated)
Consideration of undergrounding the line, including costs, feasible locations, and environmental effects	Chapter 2.0 – Alternatives including the Proposed Action and Chapter 3.0, Sections 3.2, 3.3, 3.4, 3.5, 3.6, 3.7. 3.8, 3.9, 3.10, 3.11, 3.12, and 3.13
Alternative technology – distributed generation options	Chapter 2.0 – Alternatives including the Proposed Action and Chapter 3.0, Sections 3.2, 3.3, 3.4, 3.5, 3.6, 3.7. 3.8, 3.9, 3.10, 3.11, 3.12, and 3.13

Chapter 2

Alternatives Including the Proposed Action

2 ALTERNATIVES INCLUDING THE PROPOSED ACTION

The development and assessment of alternatives is the foundation of the NEPA EIS process (40 C.F.R. 1502.14). In accordance with the provisions of NEPA, a number of alternatives that respond to the stated need for increased power reliability in southwestern Colorado are evaluated in this EIS. The alternatives addressed in this EIS include:

Routing and Technology Options for the proposed 115 kV transmission line – including locational siting alternatives and underground technologies.

Distributed Generation Options.

The No Action Alternative.

2.1 OVERVIEW OF EIS ALTERNATIVES

2.1.1 DEVELOPMENT OF TRANSMISSION ALTERNATIVES

Transmission alternatives considered in this EIS include a number of routing options for the 115 kV transmission line. Routing alternatives were initially defined after considering the purpose and need for the Project to connect between the Nucla Substation and either the Sunshine or Telluride Substation. An interconnection with the Norwood Substation was also considered necessary. The specific locations of the alternative corridors were then determined by reviewing the public scoping comments, evaluating existing and planned land use information and aerial photographs, and considering environmental factors such as avoidance of sensitive wildlife species and areas of critical environmental concern.

Plate PROJECT-1 shows the alternative routing corridors carried forward in this EIS analysis. The transmission routing alternatives are organized by substation connections. Between the Nucla Substation and the Norwood Substation three primary routing alternatives are evaluated in this document:

- ***The Nucla-Norwood Northern Alternative***
- ***The Nucla-Norwood Central Alternative***
- ***The Nucla-Norwood Southern Alternative***

From the Norwood Substation eastward to the alternative termination points, two primary routing options are considered:

- ***The Norwood-Sunshine Alternative***
- ***The Norwood-Telluride Alternative***

Construction of the proposed 115 kV system would be accomplished by combining any of the Nucla-Norwood Alternatives with either the Norwood-Sunshine or Norwood-Telluride Alternative. *Table 2.1-1* summarizes the jurisdictions that would be affected by each of these alternatives, as well as general design characteristics. Definitions and further information on pole designs, distribution line requirements, access roads, and differences between single circuit and double circuit systems can be found in Section 2.2 and in Appendix A-1 of this EIS.

Table 2.1-1
115 kV Transmission Line Characteristics

Characteristic	Nucla-Norwood Alternatives			Norwood-Sunshine/Telluride Alternatives	
	Northern Alternative	Central Alternative	Southern Alternative	Norwood-Sunshine	Norwood-Telluride
Total Length of Line (miles):	16.5	19.5	18.2	28.3	29.5
Right-of-Way By Jurisdiction (miles):					
USDA Forest Service	0.0	0.0	0.0	1.1	0.7
USDI BLM	1.5	4.2	8.5	1.1	6.3
State of Colorado	0.0	0.0	0.0	0.6	0.0
Counties – Montrose County	12.6	15.7	7.4	0.0	0.0
San Miguel County	3.9	3.8	10.8	28.3	29.5
System Design:					
Miles Constructed as Single Circuit 115 kV Line	15.0	19.0	18.2	24.7	23.0
Miles Constructed as Single Circuit 115 kV Line with Distribution Underbuilt	1.5	0.5	0.0	3.2	5.4
Miles Constructed as Double Circuit 115 kV Line	0.0	0.0	0.0	0.4	1.2
Pole Design (by type and approx. number*):					
H Frame & 3-Pole Structures	15	85	105	20	35
Single Poles Structures	175	85	30	305	305
Total Number of Structures:	**190**	**170**	**135**	**325**	**340**
Access Roads:					
T/L Miles to be constructed with existing access or overland methods:	15.7	6.5	1.6	21.3	19.7
T/L Miles to be constructed with improved access:	0.8	12.3	15.0	2.8	2.8
T/L Miles to be constructed with helicopter:	0.0	0.8	1.7	4.2	7.0
Miles of existing BLM and FS roads to be used during construction:	0.6	9.3	21.8	25.8	21.3
Miles of existing public county roads to be used during construction:	15.7	39.2	60.2	70.4	60.7

**NOTE: T/L = Transmission Line*

Pole numbers and types are estimates only and are based upon average span lengths of 450 feet for single poles and 800 feet for H-frames. Actual pole types and specific locations would be determined during final design and may vary somewhat from the estimates contained herein.

For the purposes of this EIS, it is assumed that the proposed 115 kV line could be located anywhere within 0.5 mile-wide 'corridors', except in instances where federal agencies have determined specific locations for federal lands. Within each of the corridors, an *alignment*, or *centerline*, has also been identified that represents a feasible location for the proposed 115 kV facility, based upon engineering studies and preliminary landowner discussions. Alignments are used in this EIS to evaluate the potential types and magnitudes of effects that may be caused by a 75-foot to 100-foot powerline right-of-way.[1]

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[1]*Single poles would require a 75-foot-wide ROW. H-frame and three-pole structures would require a 100-foot-wide ROW.*

In addition to the primary routing alternatives, a number of subalternatives are evaluated. Transmission subalternatives are defined as minor routing changes to portions of the primary alternatives. The overhead transmission line subalternatives are shown in *Plate PROJECT-1*, and are named Subalternative A, B, C, D, and E. An alternative site for the Norwood Substation is also evaluated as Subalternative Substation Site B. Finally, an undergrounding subalternative to portions of the Norwood-Sunshine Alternative is evaluated across private lands of Beaver, Specie Mesa, Wilson Mesa and Sunshine Mesa.

2.1.2 DEVELOPMENT OF GENERATION ALTERNATIVES

In response to public scoping and studies conducted by Competitive Utility Strategies for the San Miguel Energy Resource Group (SMERG) in 1999 (CUS 1999), the Forest Service retained independent experts in 2000 to develop and analyze distributed generation alternatives to the Nucla-Telluride 115 kV transmission system. Alternatives to the transmission proposal have been suggested by private landowners and developers as a way to avoid impacts to scenic areas of San Miguel County, including portions of Specie, Wilson, and Sunshine Mesas.

A technical report was prepared by the Forest Service's consultant, Alternative Energy Systems Consulting, Inc. (AESC 2000). This technical report is available for review at the Forest Service Norwood District Ranger Station. In developing the distributed generation alternatives for this EIS analysis, the Forest Service considered how this type of technology could best meet the stated purpose and need set forth in Chapter 1.0, be cost effective and environmentally acceptable.

For purposes of considering the relative environmental, technical and cost tradeoffs of distributed generation, three generation scenarios are evaluated in this EIS. The three alternatives primarily differ in the size and type of generators that would be required and the degree to which they would meet the stated purpose and need, as set forth in Chapter 1.0. The alternatives also differ with respect to whether the existing Nucla-Sunshine 69 kV line is assumed to remain as is, or be upgraded in the future. The generation scenarios addressed in this EIS are:

A Large Generator Alternative –This alternative would provide 40 MW of power capacity that could be used for regional and local needs. Under this scenario, the removal of the existing 44/69 kV line between the Norwood and Sunshine Substations is considered technically feasible, although SMPA has indicated that they would retain the line for distribution service (Tri-State and SMPA 2000e). Among the generation scenarios, the Large Generator Alternative would best meet the stated purpose and need set forth in Chapter 1.0 and assumes that the 13 MW of power currently provided by the Nucla-Sunshine 44/69 kV line would not be available in the future.

A Small Generator Alternative – The Small Generator Alternative would also meet the stated purpose and need for increased power reliability in southwestern Colorado and regional power transfer capability. This alternative would consist of two smaller generators with a combined capacity of 20 MW. Under this scenario, the existing Nucla-Sunshine 69 kV line would remain in place and be rebuilt by SMPA over time to meet the reliability needs of its customers and financing requirements of RUS. As such, the 13 MW of power currently provided by the Nucla-Sunshine 69 kV line would continue to be available.

Emergency Backup Generator Alternative – Under this scenario, the distributed generator would be sized and available only to provide backup power to Telluride during an emergency outage. This scenario would not meet the other stated purposes and needs for the Project as set forth in Chapter 1.0. Similar to the Large Generator Alternative, this alternative assumes that the 13 MW of power currently available from the 44/69 kV line would not be available in the future. Under this alternative, the removal of the 44/69 kV line is considered technically feasible, although SMPA has indicated the line would be retained for distribution service.

The distributed generation alternatives would also require supporting facilities including a compressor station, interconnections with the existing Kinder Morgan natural gas pipeline, and transmission, substation and distribution line modifications. Further information on the design and technical specifications associated with these alternatives is contained in Section 2.2, Detailed Description of Action Alternatives.

It is important to note that the Forest Service would not be the primary decision-making agency for a generation alternative, nor has Tri-State Generation and Transmission Association indicated that they would finance or build this type of facility. Consequently, the distributed generation alternatives are evaluated in this EIS to disclose the major environmental, engineering and cost tradeoffs that exist between the transmission and generation technologies. In order for a generation alternative to be permitted and constructed, a different proponent and financing mechanism would be necessary and additional permitting at the local and state levels would be required beyond those listed in *Table 1.5-1*. Additional environmental analyses would also be required to evaluate the effects of final design and siting.

2.2 DESCRIPTION OF ACTION ALTERNATIVES

Section 2.2 describes the various action alternatives that are evaluated in Chapter 3.0.

- Transmission System Alternatives and Subalternatives are described in Section 2.2.1
- Distributed Generation Options are presented in Section 2.2.2
- Environmental Protection Measures that have been committed to by Tri-State are listed in *Table 2.2-4*
- Additional measures that will be required of the Proponents on Federal lands are detailed in *Table 2.2-5*

2.2.1 TRANSMISSION SYSTEM CHARACTERISTICS

The proposed 115 kV transmission line would allow Tri-State to meet the purpose and needs outlined in Chapter 1.0 of this EIS. Load serving power would be transported across the proposed 115 kV transmission line and subsequently 'stepped-down' in voltage at SMPA's substation facilities. Substations would provide the interconnection between the higher voltage 115 kV transmission line and SMPA's lower voltage (i.e. 24.9 kV) distribution lines that carry power to customers' homes and businesses.

Each of the transmission alternatives considered in this EIS include the types of system improvements that have been proposed by Tri-State and SMPA in order to meet the Project's Purpose and Need:

- New 115 kV transmission line from the Nucla Generating Station to either the Sunshine or Telluride Substation;
- A variety of substation modifications including a new or expanded Norwood Substation; minor modifications to the Nucla Substation, and, depending upon the alternative selected, modifications to the Sunshine or Telluride Substation, and the Specie Mesa and Wilson Mesa Substation taps;
- Modifications to SMPA's distribution system, including construction of new overhead distribution lines and/or conversions of existing overhead and underground single phase lines to three phase.

In reviewing this section, the Reader should refer to ***Figure 2.2-1*** that shows representative pole types described in this section. *Table 2.2-1* summarizes the alternatives by jurisdiction and land requirements.

2.2.1.1 DESCRIPTION OF TRANSMISSION ALTERNATIVES AND SUBALTERNATIVES

Tri-State would be responsible for the design, construction and maintenance of the 115 kV transmission line. SMPA would continue to own and operate the distribution system and be responsible for making necessary substation modifications. Detailed information was compiled on the engineering, design and construction techniques that Tri-State and SMPA would use for the proposed Project. This information is contained in Appendix A-1 of this EIS and forms the technical basis for the analysis of potential impacts in Chapter 3.0.

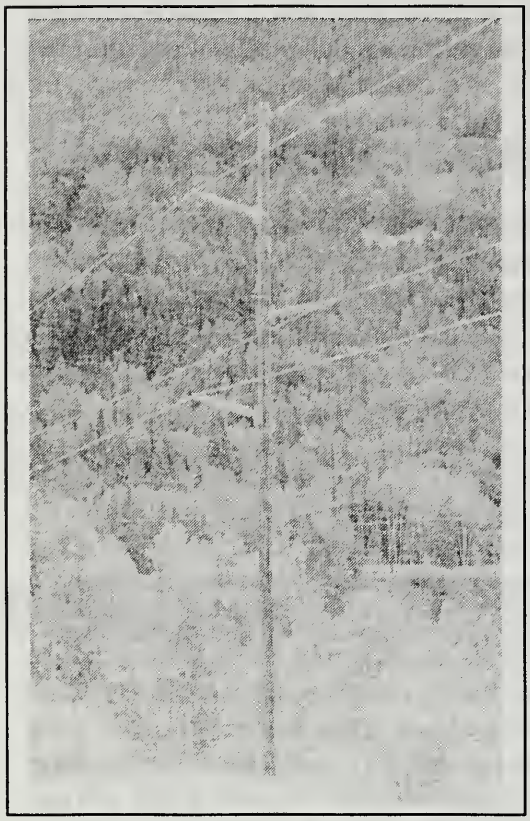
The new transmission line would be constructed and operated at 115 kilovolts (kV). The capacity of the new transmission line would be approximately 55 megawatts (MW). The Project would be constructed as a 'single-circuit' 115 kV transmission line. In areas where the transmission line would be placed on poles with another existing 115 kV line, a 'double circuit' 115 kV system would be installed to support the lines. The 115 kV line would also be 'underbuilt' in specific areas where SMPA would use the poles to support their distribution lines below the transmission conductors. Pole designs proposed by Tri-State generally consist of 'single' wood poles on private lands and 'h-frame' wood poles across federal lands. Pole types used on private and public lands will be determined by federal agencies during final design and through Tri-State's negotiations with private landowners. ***Figure 2.2-1*** shows representative pole types, including 'single pole' and 'H-frame' designs.

The proposed project will also include the placing of fiber optic capabilities in the overhead ground wire. An optical ground wire fiber optic cable will be used instead of the standard overhead ground wire that is strung at the top of the 115 kV power poles. The installation of fiber optic cable will provide the area with the broadband capability that cannot be provided with the current telecommunications network. Businesses, educational institutions, governments and homes need to be able to rapidly interface with other parts of the state and nation in order to remain competitive. Internet connectivity, advanced telecommunications and video-conferencing for schools and governments will be possible with a fiber optic link to the rest of Colorado. Using the proposed electric transmission line will provide this capability with the least environmental impact.

Table 2.1-1 summarizes the major design characteristics and access requirements of the transmission alternatives evaluated in this EIS. A 75' to 100' easement would be required by Tri-State for the proposed line. Location references for these alternatives are noted in the EIS according to 'link' and 'mile marker.' ***Plate PROJECT-2*** shows the link numbers and mile markers of the alternatives. *Table* 2.2-2 lists the actions that would be taken with each alternative by link number.

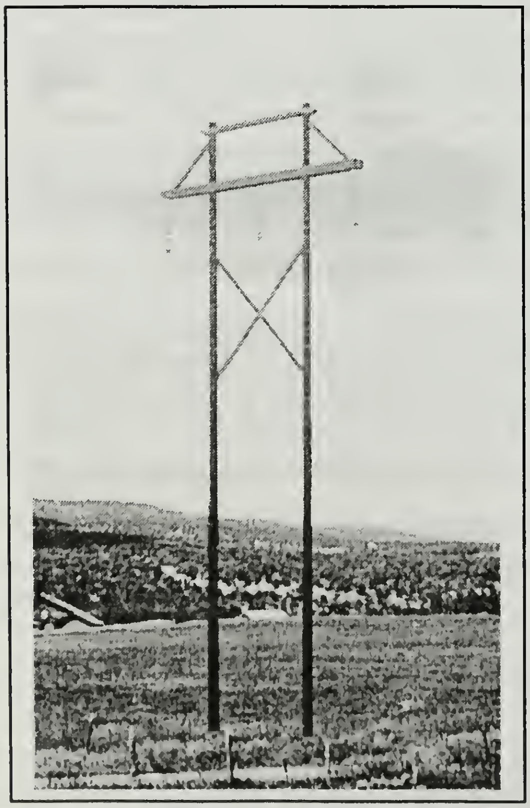
Nucla-Norwood Northern Alternative

Geographic Location. The Nucla-Norwood Northern Alternative generally consists of replacing the existing 69 kV line with a 115 kV line in the line's current location between the Nucla Substation and the Norwood Substation (Links 0, 1, 2 and 3). ***Plate PROJECT-3*** shows the system improvements associated with the alternative. The Nucla-Norwood Northern Alternative would be approximately 16.5 miles in length and would pass in a southeasterly direction through Montrose County for 12.6 miles and San Miguel County for 3.9 miles. Privately-owned lands primarily support agriculture, ranching and rural residential lifestyles. The community of Redvale is crossed on Link 1 between mile markers 7.0 and 8.0. Some public lands (1.5 miles), administered



Proposed 115 kV Single-Circuit Line
(Single Pole Structure – Avg. Height 70 ft.)

Existing 69 kV Single Pole Structure
Nucla-Sunshine Line
(Avg. Height 40 ft.)



Simulation of Proposed 115 kV
Single-Circuit Line
(*H-frame Structure – Avg. Height 70 ft.)*

Simulation of Typical 115 kV Single Pole
Structure with Distribution Underbuilt
(Avg. Height 75 ft.)

Figure 2.2-1
Representative Transmission Pole Designs

Table 2.2-1
Approximate Amount of Potential Land Disturbance by Alternative and Jurisdiction

Project Facilities and Actions	Nucla-Norwood Alternatives			Norwood-Sunshine/Telluride Alternatives	
	Northern	Central	Southern	Norwood-Sunshine	Norwood-Telluride
115 kV Transmission Line					
Short-term Disturbances (miles crossed/acres disturbed)					
USFS	0	0	0	1.1 miles/5.4 acres	0.7 mile/3.4 acres
BLM	1.5 miles/6 acres	4.2 miles/16.6 acres	8.5 miles/33.6 acres	1.1 miles/4.0 acres	6.3 miles/4.9 acres
State of Colorado	0	0	0	0.6 mile/2.9 acres	0
Private - Montrose County	11.1 miles/72.6 acres	11.5 miles/72.8 acres	3.4 miles/21.5 acres	0	0
Private - San Miguel County	3.9 miles/30.2 acres	3.8 miles/29.6 acres	6.3 miles/48 acres	25.1 miles/150.0 acres	22.5 miles/181 acres
Total Acres:	**108.8 acres**	**119.0 acres**	**103.1 acres**	**162.3 acres**	**189.3 acres**
Access Road Improvements (square feet)					
USFS	0	0	0	0	0
BLM	0	69,500	155,000	0	0
State of Colorado	0	0	0	0	0
Private - Montrose County	4,400	24,200	22,000	0	0
Private - San Miguel County	0	0	136,020	15,950	15,950
Total Square Feet/Acres:	**4400 s.f./0.1 acre**	**93700 s.f./2.1 acres**	**313020 s.f./7.2 acres**	**15,950 s.f./0.4 acre**	**15,950 s.f./0.4 acre**
Substations					
USFS	0	0	0	0.05 acre	0.02 acre
BLM	0	0	0	0	0
State of Colorado	0	0	0	0	0
Private - Montrose County	0	0	0	0	0
Private - San Miguel County	2 acres	2 acres	2 acres	0.04 acre	0.02 acre
Total Acres:	**2 acres**	**2 acres**	**2 acres**	**0.09 acre**	**0.04 acre**
69 kV Removal and Distribution Changes					
USFS	0	0	0	0	0
BLM	1.5 miles/7.9 acres	1.5 miles/7.9 acres	1.5 miles/7.9 acres	0	0
State of Colorado	0	0	0	0	4.3 acres
Private - Montrose County	12.6 miles/70.5 acres	9.2 miles/52.3 acres	9.9 miles/52.3 acres	0	0
Private - San Miguel County	3.9 miles/20.6 acres	0	3.9 miles/20.6 acres	2 miles overhead; 0.4 mile underground - 11.4 acres	2 miles overhead; 1.1 miles underground; 10.4 miles removed - 68.2 acres
Total Acres:	**99.0**	**80.8**	**80.1**	**11.4**	**72.5**
Total Acreage Disturbed:	**209.9**	**193.1**	**192.4**	**174.2**	**262.2**

Table 2.2-2
Summary of Project Alternatives by Link and Mile Marker

	Nucla-Norwood Alternatives			Norwood-Sunshine/Telluride Alternatives	
Link and Mile Marker	Northern Alternative	Central Alternative	Southern Alternative	Norwood-Sunshine Alternative	Norwood-Telluride Alternative
Link 0 0.0 - 0.1	◘ ✪	◘ ✪	◘ ✪		
Link 1 0.0 - 5.6	◘ ✪	❖	❖		
5.6 - 6.3	◙ ✪	❍	❍		
6.3 - 7.2	◘ ✪	❖	❖		
7.2 - 7.5	◙ ✪	❍	❍		
7.5 - 11.7	◘ ✪	❖	❖		
Link 2 0.0 – 2.6	◘ ✪	◘ ✪	❖		
2.6 - 3.1	◙ ✪	◙ ✪	❍		
3.1 - 4.0	◘ ✪	◘ ✪	❖		
Link 3 0.0 - 0.6	◘ ✪	◘ ✪	❖		
Link 4 0.0 - 7.0		◘	◘		
Link 5 0.0 - 7.8		◘			
Link 6 0.0 - 10.5			◘		
Link 7 0.0 - 0.5			◘		
Link 8 0.0 - 0.1			◘		
Link 9 0.0 - 0.7				◙ ✪	◙ ✪
Link 10 0.0 - 0.3				◘ ✪	◘ ✪
Link 11 0.0 - 1.8				◘ ✪	◘ ✪
Link 12 0.0 - 0.7				◘ ✪	◘ ✪
Link 13 0.0 - 10.6				◘ ✪	◘ ✪
10.6 - 14.3				◙ ✪	◙ ✪
Link 14 0.0 - 2.1				◘ ✪	❍
2.1 - 3.2				◘ ✪	▬
Link 15 0.0 - 6.8				◘ ✪	❖
6.8 - 7.2				❒ ✪	❖
Link 16 0.0 - 1.0				◘ (Sub. B)	◘ (Sub B)
Link 17 0.0 - 1.4				◘ (Sub. C)	◘ (Sub. C)
Link 18 0.0 - 0.9				◘ (Sub. D)	◘ (Sub. D)
Link 19 0.0 - 8.5					◘
Link 20 0.0 - 0.9					◙
Link 21 0.0 - 1.1					◙
1.1 - 2.2					❒
Link 22 0.0 - 1.0					◙ (Sub. E)
Link 23 0.0 - 1.7			◘ (Sub. A)		

Legend: ◘ - Single Circuit 115 kV transmission line; ◙ - Single Circuit 115 kV transmission line with distribution underbuilt; ✪ - Rebuild of existing 69 kV line to 115 kV; ❖ - 69 kV line removed; ❍ - 69 kV poles and line retained for distribution; ❒ - Double Circuit 115 kV transmission line with distribution underground; ▬ - distribution line underground.

by the BLM, would also be affected east of the Nucla Substation and south of Redvale. This alternative would entail expanding the Norwood Substation. SMPA's existing 69 kV rights-of-way would need to be widened for the 115 kV, and new easements acquired.[2]

115 kV Transmission Line. The 115 kV line would primarily be supported on single and H-frame wood poles. It is anticipated that single pole structures would be installed across most private agricultural lands. Single pole structures would be underbuilt for approximately 1.5 miles in the Redvale and Norwood areas where needed to maintain SMPA's distribution service to customers. H-frame pole structures would most likely be used across public lands, and three-pole structures would be required at locations where the line angle exceeds 5 degrees or is deadended. In total, it is estimated that this alternative would require approximately 190 structures. All of the line route would be constructed using conventional methods, either by improving existing roads or using overland construction.

Distribution System Modifications. The existing 69 kV wood poles, conductor and hardware would be removed prior to construction of the new 115 kV line. Approximately 1.5 mile of the 115 kV line would be underbuilt with distribution to maintain service to SMPA's customers (Link 1, mile markers 5.6 to 6.3, 7.2 to 7.5, and Link 2, mile markers 2.6 to 3.1).

Substation Modifications. The Nucla-Norwood Northern Alternative would entail making minor improvements to the Nucla Substation and enlarging the Norwood Substation from 0.3 acre to approximately 2 acres (Site A).

Nucla-Norwood Central Alternative

Geographic Location. The Nucla-Norwood Central Alternative would be 19.5 miles in length and would cross public BLM lands for 4.2 miles, and private lands for 15.3 miles. The 115 kV transmission line alternative would cross Montrose County for 15.7 miles and San Miguel County for 3.8 miles, following Links 0, 4, 5, 2 and 3. System improvements associated with this alternative are shown in ***Plate PROJECT-4***. This alternative would parallel Tri-State's existing Nucla-Cahone 115 kV line south of the Nucla Substation for approximately six miles before turning east and following the San Miguel and Montrose County boundary. The Central Alternative would cross Naturita Canyon (Link 5, mile markers 4.6 to 5.1) and parallel the north rim of the canyon for approximately 3.5 miles (Link 5, mike markers 5.1 to 7.8 and Link 2, mile markers 0.0 to 0.8). Along the county boundary, this alternative would converge with the existing Nucla-Sunshine 69 kV alignment southeast of Redvale and would generally follow the existing line to the Norwood Substation site. Reroutes from the existing line would occur near the new Norwood Substation site(s), and along the north rim and crossing of Naturita Canyon.

115 kV Transmission Line. The 115 kV line would be supported on both single and H-frame pole structures. Single pole structures would be used across most private agricultural lands; and pole structures would be underbuilt for approximately 0.5 mile where necessary to maintain SMPA's distribution service. Three-pole structures would be required at specific locations where the line angle exceeds five degrees or is deadended. H-frame structures would most likely be used across public lands. In total, it is estimated that this alternative would require approximately 170 structures. Approximately 18.8 miles of line would be constructed using conventional methods, either by improving existing roads or using overland construction.

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[2] *SMPA's acquired easements along the existing Nucla-Sunshine 69 kV transmission line vary in width. Typical width of easement for a 69 kV line is 50 feet.*

Helicopter construction would be used along approximately 0.8 mile of the route (see ***Plate PROJECT-4***).

Distribution System Modifications. This alternative would require that 0.5-mile of the 115 kV line be underbuilt with distribution line (Link 2, mile markers 2.6 to 3.1), west of Norwood. SMPA would remove most of the existing 69 kV line (Links 1, 2, and 3). Along approximately 1.0 mile (Link 1, mile markers 5.6 to 6.3 and 7.2 to 7.5), the 69 kV poles and line would be retained to provide distribution service to SMPA's customers.

Substation Modifications. The Nucla-Norwood Central Alternative would entail making minor improvements at the Nucla Substation and enlarging the existing 0.3 acre Norwood Substation to approximately 2.0 acres (Site A).

Nucla-Norwood Southern Alternative

Geographic Location. The Nucla-Norwood Southern Alternative would be 18.2 miles long with the 115 kV transmission line following Links 0, 4, 6, 7 and 8). System improvements associated with this alternative are shown in ***Plate PROJECT-5***. With this alternative the 115 kV transmission line would parallel the existing Nucla-Cahone 115 kV line south of the Nucla Substation for approximately six miles before turning east and following the San Miguel and Montrose County boundary for approximately two miles. At this point, the Southern Alternative would turn southeastward and generally follow existing seismic line disturbances. Naturita Canyon would be crossed west of Norwood. In total, this alternative would cross Montrose County for 7.4 miles and San Miguel County for 10.8 miles. Public lands administered by the BLM would be crossed for 8.5 miles, with the remainder in private ownership.

115 kV Transmission Line. The 115 kV line would primarily be supported on single and H-frame pole structures. Single pole structures would be used across most private agricultural lands. H-frame pole structures would most likely be used across public lands and three-pole structures would be required at specific locations where the line angle exceeds five degrees or is deadended. In total, this alternative would require approximately 135 structures. Approximately 16.5 miles of line would be constructed using conventional methods, either by improving existing roads or using overland construction. Road improvements would mainly occur on public BLM lands, where existing seismic line exploration clearances could be used for access. Helicopter construction would be used along approximately 1.7 miles of the route.

Distribution System Modifications. Modifications to SMPA's existing system would entail retaining approximately 1.5 miles of the existing 69 kV line and poles for distribution service (Link 1, mile markers 5.6 to 6.3, 7.2 to 7.5, and Link 2, mile markers 2.6 to 3.1). The remainder of the 69 kV line (Links 1, 2 and 3) would be dismantled and removed.

Substation Modifications. The Nucla-Norwood Southern Alternative would entail making minor improvements to the Nucla Substation and enlarging the existing 0.3 acre Norwood Substation to approximately 2 acres (Site A).

Norwood-Sunshine Alternative

Geographic Location. The Norwood-Sunshine 115 kV Alternative is 28.3 miles long and would consist of rebuilding the existing 69 kV line between these two substations, along Links 9, 10, 11, 12, 13, 14 and 15. Locations where system improvements would occur are illustrated in

Plate PROJECT-6. This alternative would be located in San Miguel County and would route the 115 kV transmission line across portions of Beaver, Specie, Wilson and Sunshine Mesas. A number of north-south trending canyons and creeks would be spanned including Beaver Canyon, Specie Creek, Fall Creek, Bear Creek, Bilk Creek and the South Fork of the San Miguel River. Public lands crossed by the alternative are administered by the BLM (1.1 miles), Forest Service (1.1 miles), and State of Colorado (0.6 mile). This alternative could be combined with any of the Nucla-Norwood alternatives.

115 kV Transmission Line. The 115 kV line would be supported on single pole and H-frame pole structures. Along approximately 3.2 miles of distribution lines would be underbuilt in order to maintain SMPA's distribution service to customers (Link 9, mile markers 0.0 to 0.7; Link 13, mile markers 10.6 to 13.1). Double-circuit 115 kV pole structures would also be used for approximately 0.4 mile north of the Sunshine Substation, in order to carry both the proposed line and portions of the existing Sunshine to Telluride 115 kV line (Link 15, mile markers 6.8 to 7.2). Three-pole structures would be required at specific locations where the line angle exceeds five degrees or is deadended. In total, this alternative would require approximately 325 structures. Approximately 24.1 miles of line would be constructed using conventional methods, either by improving existing roads or using overland construction. Road improvements would mainly occur on public lands. Helicopter construction would be used along approximately 4.2 miles of the route (see *Plate PROJECT-6*).

Distribution System Modifications. This alternative would require that approximately 4.0 miles of new overhead three-phase distribution line be constructed in the vicinity of the Oak Hill Substation in order to maintain service to existing customers. Distribution would also be underbuilt with the 115 kV line for 0.8 mile, in the vicinity of the Fitts (Hillside) Subdivision (Link 9, mile markers 0.0 to 0.8), and on Specie Mesa for 3.7 miles (Link 13, mile markers 10.6 to 14.3). West of the Sunshine Substation, 0.4 mile of existing distribution line would be undergrounded along South Fork Road (Link 15, mile markers 6.8 to 7.2).

Substation Modifications. The Norwood-Sunshine Alternative would entail enlarging the Sunshine Substation by 0.05 acre, dismantling the existing Oak Hill Substation, and making minor modifications to the Wilson Mesa and Specie Substations.

Norwood-Telluride Alternative

Geographic Location. This 115 kV alternative would cross San Miguel County for 29.5 miles (Links 9, 10, 11, 12, 13, 19, 20 and 21). Public lands administered by the BLM and Forest Service would be crossed for 6.3 and 0.7 miles, respectively, with the remainder in private ownership. *Plate PROJECT-7* shows where system improvements of this alternative would occur. The Norwood-Telluride Alternative would consist of rebuilding the existing 69 kV line for approximately 15.5 miles, from the Norwood Substation site to the eastern edge of Specie Mesa. At this point (Link 19), this alternative would route in a northeasterly direction across Fall Creek Road and then follow the upper benches and slopes of the San Miguel River Canyon in an easterly direction to the vicinity of Lime. This alternative would converge with an existing distribution line at Lime adjacent to the Colorado Department of Transportation (CDOT) maintenance facility. From this point at Link 20, the 115 kV line would be combined with the existing distribution line as an underbuilt for approximately 2.2 miles along the San Miguel River Canyon to the vicinity of the Ilium Business Park. The line would join with the existing Sunshine-Telluride 115 kV line as a double circuit system, east of the South Fork Road to the Telluride Substation (approximately 1.2 miles). Similar to the Norwood-Sunshine Alternative, this alternative could be combined with any of the Nucla-Norwood Alternatives.

115 kV Transmission Line. The 115 kV line would be supported on a combination of single, H-frame and three-pole structures. Single pole structures would be used primarily on private agricultural land. Along the upper rim of the San Miguel River Canyon a variety of structures would be required due to the rough terrain and steep slopes. Once the 115 kV line reaches the bottom of the San Miguel River Canyon east of Lime, single pole structures would support the distribution line as an underbuilt. Double-circuit 115 kV pole structures would also be used east of the South Fork Road, in order to carry both the proposed 115 kV line and portions of the existing Sunshine-Telluride 115 kV line. In total, this alternative would require approximately 340 structures. Approximately 22.2 miles of line would be constructed using conventional methods, either by improving existing roads or using overland construction. Helicopter construction would be used along approximately 7.0 miles of the route along the San Miguel River Canyon:

Distribution System Modifications. Changes to SMPA's distribution system are shown in *Plate PROJECT-7*. Changes would include the following:

- Four miles of new overhead line would be constructed between the Norwood and Oak Hill Substations, in order to remove the Oak Hill Substation and retain service to SMPA's customers;
- An additional 3.7 miles of distribution line would be underbuilt on the 115 kV line in the Specie Mesa area (Link 13, mile markers 10.6 to 14.3); 0.8 mile across the Fitts (Hillside) Subdivision (Link 9, mile markers 0.0 to 0.8); and 2.0 miles east of Deep Creek (Lime)(Link 20, mile markers 0.0 to 0.9 and Link 21, mile markers 0.0 to 1.1). (Total miles underbuilt: 6.5 miles);
- The existing overhead 69 kV line would be retained for approximately 2.1 miles and converted to a distribution line (Link 14, mile markers 0.0 to 2.1) from west of Fall Creek to approximately 0.5 mile west of the Wilson Mesa Substation;
- Approximately 1.1 miles of new underground three phase line would be installed west of the Wilson Mesa Substation to connect the Wilson Mesa system to the Specie Mesa Substation (Link 14, mile markers 2.1 to 3.2);
- Distribution service would be undergrounded for 1.2 miles west of the Telluride Substation in order to allow room for a double circuit 115 kV system in that area (Link 21, mile markers 1.1 to 2.2).

Substation Modifications. The Norwood-Telluride Alternative would entail modifications to the Telluride Substation, dismantling the existing Oak Hill and Wilson Mesa Substations, and making minor modifications to the Specie Substation. Transformer switch pads would also be required at the existing Wilson Mesa Substation site.

Transmission Subalternatives

Subalternatives analyzed in this EIS include minor routing variations for the 115 kV transmission line, an alternative site for the Norwood Substation, and underground options across Specie, Wilson and Sunshine Mesas. The subalternatives are shown in ***Plate PROJECT-8*** and are named: *115 kV Subalternative A, 115 kV Subalternative B, 115 kV Subalternative C, 115 kV Subalternative D*, and *115 kV Subalternative E*. *Table 2.2-3* summarizes the characteristics of the transmission subalternatives. The alternative site for an enlarged substation at Norwood is termed *Norwood Substation Alternative Site B*. Undergrounding options for portions of the Norwood-Sunshine 115 kV line are referenced as the *Underground Subalternative*.

Table 2.2-3
Characteristics of Overhead 115 kV Transmission Line Subalternatives

Characteristic	Subalternative A (Link 23)	Subalternative B (Link 16)	Subalternative C (Link 17)	Subalternative D (Link 18)	Subalternative E (Link 22)
Total Length of Line (miles) :	1.8	1.0	1.4	0.9	1.0
Primary Alternative Section Replaced (miles and link number)	1.8 (Link 6, part)	0.7 (Link 9)	1.0 (Link 9,10)	0.7 (Link 12)	0.9 (Link 20)
Right-of-Way By Jurisdiction (miles):					
USDA Forest Service	0.0	0.0	0.0	0.0	0.0
USDI BLM	1.8	0.0	0.0	0.0	0.0
State of Colorado	0.0	0.0	0.0	0.0	0.0
Private Land — Montrose County	0.0	0.0	0.0	0.0	0.0
Private Land — San Miguel County	0.0	1.0	1.4	0.9	1.0
System Design:					
Miles Constructed as Single Circuit 115 kV Line	1.8	1.0	1.4	0.9	0.0
Miles of New/Rebuilt Distribution	0.0	0.7 (Link 9)	1.4 (Link 9,10)	0.0	1.0
Miles Constructed as Double Circuit 115 kV Line	0.0	0.0	0.0	0.0	0.0
Pole Design (by type and approx. miles/number*):					
H Frame & 3-Pole Structures	3	0	0	0	0
Single Poles Structures	0	12	16	11	10
Total Number of Structures:	**3**	**12**	**16**	**11**	**10**
Access Roads:					
T/L Miles to be constructed with existing access or overland construction:	0.0	1.0	1.4	0.9	0.0
T/L Miles to be constructed with improved access:	0.0	0.0	0.0	0.0	0.0
T/L Miles to be constructed with helicopter:	1.8	0.0	0.0	0.0	1.0

**NOTE: Pole numbers and types are estimates only and are based upon average span lengths of 450 feet for single poles and 800 feet for H-frames. Actual pole types and specific locations will be determined during final design and may vary somewhat from the estimates contained herein.*

115 kV Subalternative A

Subalternative A would replace a portion of the Nucla-Norwood Southern Alternative across Naturita Canyon. Subalternative A would route the 115 kV transmission line down into Naturita Canyon, rather than spanning the canyon rim to rim. This subalternative would minimize the visual effects of spanning the canyon and marking the conductors that the primary alternative would cause. Within the canyon, the transmission pole would stay approximately 100 feet from the creek.

115 kV Subalternative B

Subalternative B is a minor routing variation for the Norwood-Sunshine and Norwood-Telluride 115 kV Alternatives. This subalternative is located east of the Norwood Substation and would entail routing the 115 kV line north of the existing Hillside (also known as Fitts) Subdivision. This subalternative would replace a portion of the existing 69 kV line with a distribution line for service to the subdivision. This subalternative would not require any additional modifications to substation facilities than those described previously for the primary alternatives.

115 kV Subalternative C

Subalternative C is also a minor routing variation for the Norwood-Sunshine and Norwood-Telluride 115 kV alternatives. This subalternative is located east of the Norwood Substation and would route the 115 kV line south of the existing Hillside (also known as Fitts) Subdivision. Similar to Subalternative B, this alternative would entail replacing a portion of the 69 kV line with a distribution line through the subdivision. This subalternative would not require any additional modifications to substation facilities than those described previously for the primary alternatives.

115 kV Subalternative D

Subalternative D is a minor reroute for a section of the Norwood-Sunshine and Norwood-Telluride 115 kV alternatives. This subalternative, located west of the Oak Hill Substation, would avoid crossing irrigated agricultural fields in a diagonal direction by following existing property boundaries and roads. This subalternative would replace a portion of the existing 69 kV line.

115 kV Subalternative E

This subalternative would replace a section of the Norwood-Telluride 115 kV Alternative between Lime and the Ilium Business Park. Subalternative E is a routing alternative west of Telluride Substation that would avoid two line crossings of Highway 145. Subalternative E would entail routing the 115 kV line on the south side of the San Miguel River from Lime to the business park vicinity. With this subalternative, the existing distribution line would be underbuilt on the 115 kV structures, and the existing distribution line and poles would be removed.

Norwood Substation Alternative Site B

The Norwood Substation Alternative Site B would entail constructing a new 2.0 acre substation facility approximately 1.0 mile southeast of the existing substation. The existing Norwood Substation would be dismantled with this alternative, and SMPA's existing distribution system would need to be extended to the new substation. Construction of two three-phase distribution lines would be required to connect SMPA's existing distribution system to the new substation. Lands affected by the Norwood Substation Alternative Site B are privately owned.

Underground Subalternative

In response to public scoping and Draft EIS comments and concerns regarding the impacts of the Project on scenic views, this FEIS evaluates an underground subalternative to portions of the Norwood-Sunshine Alternative across Beaver, Specie, Wilson, and Sunshine Mesas. In addition, an alternative routing across Specie Mesa following the Stock Drive Road is also assessed as a potential mitigation measure in Sections 3.5 and 3.6.

The underground subalternative would replace portions of the existing 69 kV overhead transmission line with an underground 115 kV cable. The subalternative consists of four stretches of privately-owned lands on Beaver, Specie, Wilson and Sunshine mesas. Between these mesas, the corridor crosses public lands characterized by steep canyon slopes, wetlands and creeks. Undergrounding across these types of canyon landscapes would result in substantially greater environmental impacts than the proposed overhead facility. In addition,

these types of landscapes would present significant engineering constraints. Consequently, the scope of the EIS analysis for an underground subalternative is limited to those stretches of Beaver, Specie, Wilson and Sunshine mesas where terrain and geotechnical conditions are suitable to underground technologies and construction practices.

The Underground Subalternative encompasses the following specific segments of the Norwood-Sunshine Alternative:

- Beaver Mesa – Link 13, mile marker 2.6 to 8.2. Total length: 5.6 miles
- Specie Mesa – Link 13, mile marker 10.5 to 14.3. Total length: 3.8 miles
- Wilson Mesa – Link 14, mile marker 2.0 to 3.2 and Link 15, mile marker 0.0 to 1.3 and 2.0 to 5.0. Total Length: 5.5 miles
- Sunshine Mesa – Link 15, mile marker 5.3 to 5.9. Total Length: 0.6 mile

The general location of this subalternative is shown in ***Plate PROJECT-8*** and can be referenced in ***Plate PROJECT-2*** by link and milepost.

Scope of Analysis

An engineering feasibility study was conducted by Power Engineers in 1999 for Specie Mesa. Information from this report was used to develop general cost estimates for the underground subalternative, as reported in the Draft EIS. As part of the FEIS, Power Engineers provided additional information on construction and maintenance issues, as well as more detailed cost estimates for installing underground cables across each of the four mesas. Power Engineers' Report (September 2001) is contained in the FEIS as Appendix A-5. Information provided in this section of the FEIS is based upon Power Engineers' reports, as well as supplemental information developed by Tri-State (Tri-State, September 2001).

Underground System Designs

There are two types of potentially suitable cable systems that could be used across the mesas: solid dielectric cable (XLPE) and high pressure gas filled (HPGF) pipe-type cable. Overall, the HPGF system is the most expensive and requires the most inspection and annual maintenance. The pressurization system also requires a monitoring system and regular maintenance. Few of these type systems have been built in recent years. In comparison, the XLPE type system has been installed in various parts of the U.S. and has been identified by Tri-State as the most likely system that would be used. The EIS analysis of undergrounding therefore primarily addresses the XLPE system options. Underground cable systems typically have a life of approximately 30 to 35 years. In comparison, overhead systems have life expectancies of approximately 50 years.

Direct Buried System. Direct buried, single circuit; cable systems installed in trenches are the most economical means for undergrounding transmission lines. When more than one cable circuit must be installed in a single trench, excavation costs for the required additional trench width may reduce the cost efficiency of the direct buried option. Trenching for direct burial of cables typically results in disruption of traffic and/or surface activities and facilities. A significant limitation of direct buried cables is their vulnerability to dig-in related damages after installation (e.g. from construction of other underground utilities, etc.). (See Appendix A-5, *Figure* 2 for a cross-section of a typical cross-section for direct buried cables).

Duct Bank System. In lieu of direct burial, cables can be installed in ducts. Tri-State has indicated that this is the type of system they would prefer to use if portions of the Nucla-Telluride line are undergrounded. Concrete or plastic ducts are available for use and generally encased in concrete. Duct installation of underground cable systems may be economical when many circuits are to be installed in a confined area. Spare ducts are sometimes included to allow future installation of additional cable circuits. The duct system provides supplemental dig-in protection for the cables,

minimizes the probability of concurrent failures of adjacent cables or circuits, and minimizes the length of trench open at any one time. The cables are pulled into the ducts after the backfilling operation has been completed. (See Appendix A-5, ***Figure 4*** for an illustration of a typical encased duct bank system).

Manholes would be installed along the duct line at spacing not exceeding maximum cable pulling lengths. When cable faults occur in duct systems, the faulted cable section is pulled out and replaced between adjacent manholes.

At the ends of the underground line, termination poles or structures are necessary to transition from the underground line to overhead. Appendix A-5, ***Figure 7*** is a schematic of a transition structure. These types of structures would be used at the edges of the mesas. These stations generally require an area about 200 feet by 200 feet (about 0.9 acres). Bus work, termination structures, and a control equipment building would be required at each site. Maximum structure height would be about 80 feet.

Construction Practices

Construction. The basic sequence of construction and installation activities is the same for all underground transmission cable system projects. They include route surveying; soils evaluation; excavation; cable, pipe or duct installation; backfilling and surface restoration; and cable, splice, termination and auxiliary equipment installation and testing and commissioning. Appendix A-5 provides additional information on underground construction practices.

Appendix A-5, ***Figure 6*** shows a cross-sectional view of a transmission cable system right-of-way during construction. In total, the trench would be three to five feet wide and the construction corridor would be approximately 40 feet wide. Technically, the distribution cables could be placed in the same trench with the 115 kV cable, where necessary (Power Engineers, 2001). SMPA has stated, however, that they would require a separate trench, approximately 20 feet from the 115 kV cable (SMPA, 2001).

The land over and in the vicinity of the line would have to be maintained free of trees and shrubs. During construction, the trench would have to remain open with the direct burial method. In comparison, the duct bank construction would allow backfilling of the trench to be completed as the cables are installed. In sensitive wetland areas, directional drilling may be used where avoidance of wetlands is not feasible.

In all buried transmission cable systems, thermal performance is a key concern. The load (MVA) capacity of cable is dependent upon the thermal dissipation properties of the cables themselves and the backfill material. Cable thermal properties are predictable, but the thermal resistivity of soils is soil type and moisture content related. Use of thermal or select backfill will probably be required to obtain required thermal properties.

Operation and Maintenance Practices

The permanent easement for an underground cable system is typically 20 to 40 feet in width, depending on terrain and whether distribution lines are also placed in the underground corridor.

Operation of XLPE underground transmission cable systems requires little, if any, operator intervention. The systems are designed to operate automatically. The maintenance of XLPE systems is limited to inspection, testing and preventive maintenance, and repair or replacement of cables, splices and terminations.

A limitation of the XLPE cable systems is the deterioration of cable insulation over time. Non-destructive tests for evaluating the condition of XLPE cable include measurement of dc leakage current, dielectric loss power factor, and ac partial discharge. Two additional tests, absorption current and residual voltage measurements, have been developed in Japan. Unfortunately, none of these tests reliably indicate remaining cable life or cable condition.

Repairs of underground cable systems can be substantial in terms of time and costs. Repair of cable splices and terminations involves locating the faulted component; digging to expose a failed splice, if direct buried, or locating a failed splice in a manhole or a failed termination on a termination structure or in a substation; and repairing or replacing the component as required. Surface improvement restoration may also be required after repair or replacement of a direct buried splice.

Typical outage times for XLPE systems are estimated at 1 week as compared to 20.5 hours for overhead systems. The times estimated for XLPE systems include fault location and repair times only. If fault location and repair procedures are to be performed by a contractor, contract preparation, bid and award times, and contractor mobilization time must be added to the typical outage times.

Tri-State's Underground Policy

Tri-State has an Undergrounding Policy that pertains to this subalternative (see Appendix A-2). Tri-State's policy sets forth the following scope, terms and conditions under which transmission lines would be undergrounded:

1. "Tri-State will consider the construction of underground high voltage transmission facilities when local jurisdictions or landowners agree to advance the increased cost of the construction and operation of such facilities. The increased cost of the underground facilities will not be borne by Tri-State, but must be borne by the local jurisdictions or landowners who agree to pay for the same.
2. Once a request to construct underground high voltage transmission facilities has been received, Tri-State will estimate the cost of construction and operation of comparable overhead and underground facilities in order to determine the increased cost of the underground construction and operation. Information as to the amount of the cost of constructing and operating comparable overhead and underground facilities will be furnished to the party(ies) requesting such construction and operation.
3. Tri-State will allow such party(ies) six (6) months for arrangements for financing to be completed. After this period, if such arrangements have not been completed, Tri-State will normally construct the facilities overhead.
4. Tri-State will not construct an underground high voltage transmission facility to serve a radial load (a load with only one source of power), unless provision for a reliable alternative source of power is made and paid for by the party(ies) requesting such construction.
5. Tri-State will not construct an underground high voltage facility which will compromise the reliability of the transmission system. Examples of actions which may compromise the reliability of the transmission system include, but are not limited to, constructing such facilities in or through rough terrain, dangerous river or stream crossings, floodplains, areas with seasonally restricted access, or other uncertain geological conditions." (Tri-State, Policy 113. December 2, 1998)

The Forest Service and BLM take no position regarding this policy. RUS has reviewed Tri-State's policy concerning undergrounding transmission facilities and found it to be a reasonable and prudent policy. It is important to note that lands evaluated in the Underground Subalternative are located on private lands in San Miguel County. No federal permits would be required.

2.2.1.2 CONSTRUCTION AND OPERATION PRACTICES

Descriptions of Tri-State and SMPA's proposed facilities and construction and operation practices for the transmission, distribution and substation facilities are contained in Appendix A-1. Workforce and equipment information is also provided in this appendix.

2.2.1.3 SCHEDULE

The overall time frame for constructing the proposed transmission line is approximately 10 months, which would extend over a two-year construction period. Appendix A-1 contains a detailed schedule for constructing the transmission, substation and distribution facilities.

2.2.1.4 COSTS

The cost estimates for the proposed project and alternatives are based on industry standards for overhead and underground transmission system construction. The cost assumptions for the overhead and underground systems are described below. The cost estimates are intended to provide the reader information on the magnitude of costs associated with each technology. Final actual costs would vary from these estimates, however, based on a number of factors as described below.

Overhead Transmission System Alternatives. Costs of constructing the proposed project have been estimated by Tri-State to range between $12,666,000.00 to $13,920,000.00 depending on the alternative. These costs include estimates for engineering, right-of-way acquisition, materials, and construction labor and equipment. The cost estimates for the alternatives are inclusive of the 115 kV transmission line, substation and distribution system modifications. Total costs for the proposed project (Nucla-Norwood Central and Norwood to Sunshine) are estimated at $13,197,000.00. Cost breakdowns by alternative can be found in Appendix A-1, *Table A-4-2*.

Tri-State's costs of the 115 kV transmission line alone were estimated in the DEIS at $9,536,000.00 for the proposed route (Nucla-Norwood Central Alternative and Norwood-Sunshine Alternative). With a total length of approximately 47.8 miles, the average overhead construction costs were estimated by Tri-State to be approximately $199,498.00 per mile. Cost estimates reported in the FEIS have been adjusted to $176,077.44 per mile, in instances where comparisons are made with underground cost estimates. In these comparisons, no estimates for right-of-way acquisition are included.

The right-of-way requirements for a 115 kV transmission line would vary from 75 feet to 100 feet in width for single and h-frame structures, respectively. Although SMPA has some existing easement agreements along the 69 kV transmission line, the extent of those agreements has not been analyzed. The EIS analysis assumes that Tri-State would acquire whole new rights-of-way for the proposed 115 kV system. For purposes of the FEIS, right-of-way acquisition costs are not included in the estimates compared to underground cables.

It is recognized that the costs of right-of-way acquisition would vary significantly from property to property depending on location and property value. Section 3.11 of the FEIS contains a summary of land values in San Miguel County (See *Table 3.11-5*). Property values in San Miguel County may range from several thousand to over $35,000.00 per acre. Property values in Montrose County and the western part of the project area between Nucla and Norwood would be expected to be less, and generally in the range of $1,000 to $2,000 an acre. It should also be noted that these cost estimates do not include any estimates of property value decreases that may occur depending on site-specific conditions. Consequently, the estimates contained in this EIS are considered appropriate only for considering the overall magnitude of costs for each type of alternative, and are not intended to be used for estimating right-of-way or property value costs for individual properties that may be affected.

Underground Transmission Cable Systems. Estimates for the underground subalternative were developed by Power Engineers (September 2001) for XLPE direct bury and duct bank installation methods. Power Engineers' estimates for Beaver, Specie, Wilson, and Sunshine mesas considered construction materials and labor and are summarized below:

- Beaver Mesa (5.6 miles) – duct bank: $8,209,329.00; direct bury: $6,265,708.00
- Specie Mesa (3.8 miles) – duct bank: $5,493,883.00; direct bury: $5,170,040.00

- Wilson Mesa (5.5 miles) – duct bank: $7,919,762.00; direct bury: $7,401,826.00
- Sunshine Mesa (0.6 mile) – duct bank: $1,054,099; direct bury: $934,418.20

Similar to the overhead cost estimates, a number of cost items are not included in these estimates since they would not appreciably alter the overall magnitude of cost differences between overhead and underground systems. Costs not estimated for underground cable systems include right-of-way acquisition costs, increased costs of maintenance due to the specialized nature of underground systems, costs for undergrounding distribution lines, costs for directional drilling, if required, or replacement costs due to the reduced life of underground cables compared to overhead systems. As such, these cost estimates do not represent a present worth analysis that would be developed by Tri-State during final negotiations with landowners. Construction costs for the underground cable systems are contained in Appendix A-5. Compared to the overhead transmission system costs of approximately $176,000.00 to $200,000.00 per mile, average costs per mile for underground transmission cable technologies vary from $1.4 million across Wilson Mesa to $1.7 million across Sunshine Mesa.

The width of permanent rights-of-way necessary for an underground 115 kV system are estimated to range from 20 feet to 40 feet, depending on whether the distribution lines would also be undergrounded. As discussed above, no costs have been included in these estimates for right-of-way acquisition.

2.2.1.5 ENVIRONMENTAL PROTECTION MEASURES

To minimize project construction and operation effects, Tri-State has committed to implementing a number of environmental protection measures. These measures are listed in *Table 2.2-4* and would be implemented regardless of the transmission alternative selected. Additional measures that would be required by the Forest Service and BLM are shown in *Table 2.2-5* and include Best Management Practices (BMPs). Tri-State would also be required to provide a Construction, Operation and Maintenance Plan (CO&M) fully describing the site specific environmental protection measures that will be employed for the Project.

2.2.2 DISTRIBUTED GENERATION ALTERNATIVES

2.2.2.1 BACKGROUND

Distributed generation alternatives were developed for this EIS in response to public comments. These options have been suggested by private landowners and the SMERG as a way to provide for local power reliability and, at the same time, avoid the visual impacts of the proposed transmission line on scenic areas of San Miguel County. In response to these comments and concerns, the Forest Service commissioned an independent analysis to evaluate the feasibility and tradeoffs of this type of alternative. The technical study, conducted by the Forest Service's consultant, Alternative Energy Systems Consulting, Inc. (AESC 2000), contains the detailed technical engineering and cost information used in the EIS analyses. The technical report is available for review at the Forest Service's Norwood District Ranger Station.

The EIS analysis of distributed generation options evaluates how this type of technology could meet the stated purpose and need for the Project and determines what the environmental and cost tradeoffs would be, compared to the transmission alternatives. Three scenarios for distributed generation were developed. These scenarios are based upon differing assumptions regarding whether the existing Nucla-Sunshine 69 kV line would remain in place, and to what degree distributed generation would be intended to meet the regional as well as local purposes for the Project (See Chapter 1.0, Purpose and Need). The analysis also considered potential cost savings that might be realized by using refurbished generators, rather than new models.

Table 2.2-4
Tri-State's Standard and Committed Mitigation Measures

Mitigation Number	Mitigation Measure
1	The contractor shall limit the movement of its crews and equipment to the ROW, and access routes. The contractor shall limit movement on the ROW so as to minimize damage to grazing land, crops or property, and shall minimize marring the land.
2	When weather and ground conditions permit, the contractor shall obliterate all contractor-caused deep ruts that are hazardous to farming operations and to movement of equipment. Such ruts shall be leveled, filled and graded, or otherwise eliminated in an approved manner. In hay meadows, alfalfa fields, pastures and cultivated productive lands, ruts, scars and compacted soils shall have the soil loosened and leveled by scarifying, harrowing, disking or other approved methods. Damage to ditches, tile drains, terraces, roads and other features of the land shall be corrected. Before final acceptance of the work in these agricultural areas, all ruts shall be obliterated, and all trails and area that are hard-packed as a result of contractor operations shall be loosened, leveled and reseeded. The land and facilities shall be restored as nearly as practicable to their original conditions.
3	Water bars or small terraces shall be constructed across all ROW and access roads on hillsides to prevent water erosion and to facilitate natural revegetation.
4	The contractor will comply with all federal, state and local environmental laws, orders and regulations. Prior to construction, all supervisory construction personnel will be instructed on the protection of cultural and ecological resources. To assist in this effort, the construction contract will address: (a) federal and state laws regarding antiquities and plants and wildlife, including collection and removal, and (b) the importance of these resources and the purpose and necessity of protecting them.
5	The contractor shall exercise care to preserve the natural landscape and shall conduct its construction operations so as to prevent any unnecessary destruction, scarring or defacing of the natural surroundings in the vicinity of the work. Except where clearing is required for permanent works, approved construction roads or excavation operations, all trees, native shrubbery and vegetation shall be preserved and shall be protected from damage by the contractor's construction operations and equipment. The edges of clearings and cuts through trees, shrubbery and other vegetation shall be irregularly shaped to soften the undesirable visual impact of straight lines.
6	On completion of the work, all work areas (except access roads) shall be scarified or left in a condition that will facilitate natural revegetation, provide for proper drainage and prevent erosion. All destruction, scarring, damage or defacing of the landscape resulting from the contractor's operations shall be repaired by the contractor.
7	Construction staging areas shall be located and arranged in a manner to preserve trees and vegetation to the maximum practicable extent. On abandonment, all storage and construction buildings, including concrete footings and slabs, and all construction material and debris shall be removed from the site. The area shall be regraded as required so that all surfaces drain naturally, blend with the natural terrain and are left in a condition that will facilitate natural revegetation, provide for proper drainage and prevent erosion.
8	Construction activities shall be performed by methods that will prevent entrance or accidental spillage of solid matter, contaminants, debris, any other objectionable pollutants and wastes into streams, flowing or dry watercourses, lakes and underground water sources. Such pollutants and waste include, but are not restricted to sediment, refuse, garbage, cement, concrete, sanitary waste, industrial waste, radioactive substances, oil and other petroleum products, aggregate processing tailing, mineral salts and thermal pollution.
9	Dewatering work for structure foundations or earthwork operations adjacent to or encroaching on streams or watercourses shall be conducted in a manner to prevent muddy water and eroded materials from entering the streams or watercourses by construction of intercepting ditches, bypass channels, barriers, settling ponds or by other approved methods.
10	Excavated material or other construction materials shall not be stockpiled or deposited near or on streambanks, lake shorelines or other watercourse perimeters where they can be washed away by high water or storm runoff or can in any way encroach upon the actual watercourse itself.
11	Wastewaters from concrete batching or other construction operations shall not enter streams, watercourses or other surface waters without the use of such turbidity control methods as settling ponds, gravel-filter entrapment dikes, approved flocculating processes that are not harmful to fish, recirculating systems for washing of aggregates, or other approved methods. Any such wastewaters discharged into surface waters shall be essentially free of settleable material. For the purpose of these specifications, settleable material is defined as that material which will settle from the water by gravity during a 1-hour quiescent detention period.

Table 2.2-4 **Tri-State's Standard and Committed Mitigation Measures**	
Mitigation Number	**Mitigation Measure**
12	The contractor shall utilize such practicable methods and device as are reasonably available to control, prevent and otherwise minimize atmospheric emissions or discharges of air contaminants.
13	The emission of dust into the atmosphere will not be permitted during the manufacture, handling and storage of concrete aggregate; and the contractor shall use such methods and equipment as necessary for the collection and disposal or prevention of dust during these operations. The contractor's methods of storing and handling cement and pozzolans shall also include means of eliminating atmospheric discharge of dust.
14	Equipment and vehicles that show excessive emissions of exhaust gases due to pool engine adjustments or other inefficient operating conditions shall not be operated until repairs or adjustments are made.
15	The contractor shall prevent any nuisance to persons, damage to crops, cultivated fields and dwelling from dust originating from his operations. Dust nuisance resulting from construction activities shall be prevented by periodic watering of disturbed soils on access and haul roads and the covering of stockpiles. Oil and other petroleum derivatives shall not be used for dust control. Speed limits shall be enforced, based on road conditions, to reduce dust problems.
16	To avoid nuisance conditions due to construction noise, all internal combustion engines used in connection with construction activity shall be fitted with an approved muffler and spark arrester.
17	The contractor shall remove all other waste materials from the construction area. All materials resulting from the contractor's clearing operations shall be removed from the ROW.
18	The contractor shall make all necessary provisions in conformance with safety requirements for maintaining the flow of public traffic and shall conduct its construction operations to offer the least possible obstruction and inconvenience to public traffic.
19	The contractor will apply necessary mitigation to eliminate problems of induced currents and voltages onto conductive objects sharing a ROW, to the mutual satisfaction of the parties involved. The contractor will install fence grounds, where required, on fences that cross or are parallel to the proposed line.
20	Tri-State will avoid physical disturbance in wetlands, streams and riparian areas. If these areas cannot be avoided, a qualified biological contractor shall conduct site-specific assessments for each affected site. These assessments shall be conducted in accordance with ACOE wetlands delineation guidelines, and shall include development of impact minimization or site avoidance measures. The appropriate measures may be required by the landowner or federal authorized officer. include an assessment of potential avoidance or minimization measures.
21	Access ways will be located to avoid wetlands, where practical; or if they are linear, to cross them at the least sensitive feasible point.
22	Unavoidable, permanent, direct impacts to jurisdictional wetlands and riparian habitats shall be mitigated at a ratio of no less than 1:1 to ensure compliance with the federal policy of 'No Net Loss' of wetlands. Depending upon the agency approval, mitigation can be accomplished through a variety and/or combination of approaches such as (1) the creation of habitat that replaces the values and functions of the habitat(s) lost; (2) the purchasing of similar high quality habitat and its placement in a conservation easement that will ensure its management for biological resources in perpetuity; and (3) the enhancement of existing degraded habitat through exotic species removal and native plantings. All mitigation shall be implemented within the watershed(s) where the impacts occur to the extent practicable.
23	All surface disturbance on public and National Forest lands will be seeded with native seed mixtures that have been approved by the respective agency. Seed mixes on private land will be at the discretion of the landowner. For a period of three years after reclamation, Tri-State will hire an independent contractor to evaluate and report annually to respective land management agencies on the status of reclaimed sites and the presence of noxious or invasive weeds. Where invasions of weedy species are noted by the contractor, Tri-State will treat noxious weeds using methods approved by the San Miguel Basin Weed Board on private land and BLM/Forest Service on public/National Forest land.
24	Removal of vegetation will be minimized to avoid creating a swath along the ROW.
25	Topsoil will be removed, stockpiled, and respread at all heavily disturbed areas not needed for maintenance access.
26	All disturbed areas not needed for maintenance access will be reseeded.
27	Disturbed areas will be mulched and fertilized, where necessary, to achieve establishment of a herbaceous ground cover capable of stabilizing soils and preventing erosion.

Table 2.2-4
Tri-State's Standard and Committed Mitigation Measures

Mitigation Number	Mitigation Measure
28	Erosion control measures will be implemented on disturbed areas, including areas that must be used for maintenance operations (access ways and areas around structures).
29	The minimum area will be used for access roads (12 feet to 14 feet wide, except where roadless construction is used), and a 20-foot maximum clear area will be maintained around structures,
30	Structures will be located and designed to conform with the terrain. Leveling and benching of the structure sites will be the minimum necessary to allow structure assembly and erection.
31	Access ways will be located (not necessarily within the line ROW) to utilize the least steep terrain and, therefore, to disturb the smallest area feasible.
32	Careful structure location will ensure spanning of narrow flood prone areas.
33	Where floodplains are too wide to be spanned, structures will be located so that the minimum number of structures occur within the flood area, and those will be in areas of least depth and current. Structures potentially subject to flood flows would be designed and constructed to withstand flood flows, and in accordance with local floodplain regulations.
34	Geotechnical survey before construction should identify most areas that may become active. Rerouting the line, and particularly its access roads, around such areas and/or earth stabilization work, such as dewatering, regrading, deep pile foundations to transmission line poles, will reduce the risk of movement initiated by construction.
35	Structures will not be sited on any potentially active faults.
36	Structure sites and other disturbed areas will be located at least 300 feet, where practical, from rivers, streams (including ephemeral streams), ponds, lakes and reservoirs.
37	New access roads will be located at least 300 feet, where practical, from rivers, ponds, lakes, and reservoirs.
38	At crossings of perennial streams by new access roads, culverts of adequate size to accommodate the 25-year estimated peak flood flow of the stream will be installed. Construction areas will minimize disturbance of the stream banks and beds during construction. The mitigation measures listed for soil/vegetation resources will be performed on areas disturbed during culvert construction. Culverts will be designed and installed to allow for fish passage.
39	If the banks of ephemeral stream crossings are sufficiently high and steep that breaking them down for a crossing would cause excessive disturbance, culverts will be installed using the same measures as for culverts on perennial streams.
40	Blasting will not be allowed in or near streams without adequately protecting the stream from debris.
41	Structures will be located, where practical, to span small occurrences of sensitive land uses, such as cultivated areas. Where practicable, construction access ways will be located to avoid sensitive conditions.
42	ROW will be purchased at fair market value and payment will be made of full value for property damages during construction or maintenance.
43	The line will be designed to minimize noise and other effects from energized conductors.
44	Location of all structure sites, access roads and other areas of disturbance will be reviewed with landowners or management agencies.
45	Before construction, Tri-State will perform a Class III (100% of surface) cultural survey on all areas to be disturbed, including structure sites and new access ways. A product of the survey will be a Cultural Resources Report, recording findings and suggesting mitigation measures. These findings will be reviewed with the State Historic Preservation Offices and other appropriate agencies, and specific mitigation measures necessary for each site or resources will be determined. Mitigation may include careful relocation of access roads, structure sites and other disturbed areas to avoid cultural sites that should not be disturbed, or data recovery if impacts are unavoidable.
46	Prior to construction, all supervisory construction personnel will be instructed on the protection of cultural resources with reference to relevant laws and penalties, and the need to cease work in the location if cultural resource items are discovered.
47	Should any cultural resources that were not discovered during the Class III Survey be encountered during construction, ground disturbance activities at that location will be suspended until the provisions of the National Historic Preservation Act and enabling legislation have been carried out.

Table 2.2-4 **Tri-State's Standard and Committed Mitigation Measures**	
Mitigation Number	**Mitigation Measure**
48	Construction activities will be monitored or sites flagged by Forest Service and BLM staff to prevent inadvertent destruction of any cultural resource for which the agreed mitigation was avoidance.
49	Construction crews will be monitored to the extent possible to prevent unauthorized removal or disturbance of cultural artifacts or materials from sites where the agreed mitigation was avoidance.
0	Clearing for access roads will be limited to only trees necessary to permit the passage of equipment.
51	Access roads will be routed to control grades rather than a straight line along the ROW where steep features would result in a higher disturbance.
52	To protect sage grouse from avian predation, perch-proof single-pole construction will be used on the transmission line within the sage grouse overall range and a one mile buffer on each side of the overall range on Beaver Mesa.
53	To protect breeding sage grouse, construction and routine maintenance activities will not occur within 2 miles of an active lek site from March 1 through July 15, or within one mile of sage grouse nesting habitat from April 15 through July 15. Potential impacts to wintering birds will be avoided by the seasonal closures for big game (See number 55 below).
54	To protect wintering elk and mule deer, construction and routine maintenance activities will not occur within elk or mule deer winter concentration areas or severe winter range from December 15 through April 15. The agency biologists may allow an exception to this restriction if weather conditions warrant it.
55	To protect calving and migrating elk, construction and routine maintenance activities will not occur in elk calving areas from May 15 through June 30, and in elk migration corridors from May 1 through May 31 and September 15 through October 30.
56	In order to avoid potential bird electrocutions and bird collisions with power lines, Tri-State and SMPA will incorporate state-of-the-art practices, as outlined by the Avian Power Line Interaction Committee (APLIC) (1994, 1996)
57	Prior to construction of the Project, qualified independent contractor(s) shall be retained by Tri-State to meet with Project engineers and agency representatives to review design plans, discuss areas of environmental sensitivity within the Project area, and, in particular, those areas where a monitor must be present during construction. Where needed, the contractor(s) will meet with the engineer(s) and agency representatives in the field to determine methods to avoid or minimize impacts to sensitive resources to the greatest extent possible.
58	In order to mitigate for potential impacts to special status fish, Tri-State will limit water usage to approximately two acre feet and pay the appropriate water depletion fee to the agency providing water during construction (e.g. for dust abatement).

Table 2.2-5 Watershed Conservation Practices for the Nucla-Telluride Transmission Line Project	
Forest Service Standard Best Management Practices and Bureau of Land Management Required Construction Practices	
1	Maintain the organic ground cover so that pedestals, rills, and surface runoff are not increased.
2	Remove no vegetation that will cause long-term change to lower stream health class in any stream reach.
3	Keep heavy equipment out of perennial and intermittent streams and lakes, except to cross at designated points, build crossing, or do restoration work, or if protected by snow cover or frozen soil. Never operate equipment in streams during fish spawning periods.
4	Do not excavate borrow material from, or store excavated borrow material in, any stream, lake, wetland or water influence zone.
5	Install stream crossings to meet Corps of Engineers and State permit criteria, pass low flows, and have at least an 80% chance of remaining stable against floods (not washing out) during their design life.
6	Install stream crossings on straight reaches, as perpendicular to flow as feasible, and to provide passage of fish and other aquatic life.
7	Install stream crossings in this order of preference as feasible: bridge, hardened ford, bottomless arch, pipe culvert. Set fords and culvert bottoms at natural streambed levels. Keep streambeds as intact as feasible.
8	Keep ground vehicles out of wetlands unless the wetland is protected by snow cover or frozen soil. Do not disrupt surface or subsurface water flow into wetlands with up slope roads, trails and similar soil disturbances.
9	Construct roads or trails and similar soil disturbances on ridge tops, stable upper slopes, or wide valley terraces if feasible. Avoid full-bench construction if feasible, or end-haul, or stabilize soil onsite. Avoid sustained slopes steeper than 70%.
10	Do not allow soil-disturbing actions during periods of heavy rain or wet soils. Apply travel restrictions to protect soil and water.
11	Where feasible, construct temporary and intermittent service roads with drainage facilities other than ditches and culverts.
12	Retain stabilizing vegetation on unstable soils. Do not construct new roads or use heavy equipment on unstable or highly erodible soils.
13	Use existing roads, trails, and other soil disturbances unless other options will produce less sediment. Reconstruct to ensure long-term soil and drainage stability.
14	Designate, construct, and maintain off highway vehicles (OHV) travel ways for proper drainage. Stabilize all OHV stream crossings.
15	Design all roads, trails, and other soil disturbances to the minimum standard for their use and to "roll" with the terrain as feasible.
16	Use filter strips, and sediment traps if needed, to keep all sand-sized sediment on the land and disconnect disturbed soil from streams, lakes, and wetlands. Disperse runoff into filter strips.
17	Remove or breach berms that would concentrate runoff without disturbing the original road surface and drainage features.
18	Site-prepare, drain, revegetate, and close roads, trails, and similar soil disturbances within one year after use ends. Provide natural drainage that disperses runoff into filter strips and maintains stable fills. Do this work concurrently. Use native vegetation as feasible.
19	Remove all temporary stream crossings, including all fill material in the active channel, restore the channel grade, and revegetate the channel banks using native vegetation as feasible.
20	Locate vehicle service and refueling areas, chemical storage and use areas, and waste dumps and areas on gentle upland sites.
21	Install contour berms and trenches around vehicle service and refueling areas, chemical storage and use area, and waste dumps to fully contain spills. Use liners as needed to prevent seepage to ground water.
22	Inspect equipment used to store, transport, mix, or apply chemicals daily for leaks. If leaks or spills occur, install emergency traps immediately to contain them and clean them up.
23	All surface disturbance on public and National Forest lands will be seeded with native seed mixtures that have been approved by the agency. Seed mixes on private land will be at the discretion of the landowner. For a period of three years after reclamation, Tri-State will hire an independent contractor to evaluate and report annually to the respective land management agency on the status of reclaimed sites and the presence of noxious or invasive weeds. Where invasions of weedy species are noted by the contractor, Tri-State will treat noxious weeds using methods approved by the San Miguel Basin Weed Board.

Table 2.2-5 **Watershed Conservation Practices for the Nucla-Telluride Transmission Line Project**	
24	Trim trees in preference to cutting trees and cut trees in preference to bulldozing them as determined by the agency authorized representative. All trees cut or bulldozed for clearance will be removed from the right-of-way.
25	Remove only the minimum amount of soils and vegetation necessary for the construction of structures and facilities. Topsoil will be conserved during excavation and reused as cover on disturbed areas to facilitate regrowth of vegetation.
26	No construction or routine maintenance activities will be performed during periods when the soil is too wet to adequately support construction equipment.
27	In order to avoid electrocution hazards to birds, the powerline will be constructed in accordance with standards outlined in 'Suggested Practices for Raptor Protection on Powerlines,': The State of the Art in 1996. Avian Power Line Interaction Committee (APLIC).
28	In order to minimize bird collisions with powerlines, a qualified biologist will evaluate the selected alternative prior to construction, and recommend areas where bird flight diverters as specified by APLIC (1994) will be installed on the transmission line. Areas to be considered will include transmission lines protruding above surrounding forest canopy, canyon crossings, and any areas of unusually high bird use during migration or daily flight patterns.
29	All disturbed areas will be recontoured and all earthwork obliterated by removing embankments, backfilling excavations, and grading to re-establish the approximate original contours of the land in the right-of-way and along designated access routes.
30	All roads, access routes and temporary construction areas will be approved by the agency authorized representative. The level and degree of rehabilitation will be determined by the agency authorized representative.
31	On federally managed lands, conduct surveys for sensitive plant species in areas of potential habitat prior to any Project-related surface disturbance. Surveys will be conducted by qualified biologists. If any populations of sensitive plant species are present within any area where Project-related surface disturbance would occur, structures or disturbances will be relocated, wherever possible, to avoid or minimize impacts.
32	To protect southwestern willow flycatchers, no surface disturbance of suitable breeding habitat will occur. Furthermore, to protect breeding southwestern willow flycatchers, either (1) construction and routine maintenance activities will not occur within 0.25 mile of suitable breeding habitat from May 1 through August 15, or (2) surveys for breeding southwestern willow flycatchers may be conducted during the planned year of construction in all suitable breeding habitat within 0.25 mile of the selected alternative to determine if construction may commence before August 15th.
33	To protect nesting Mexican spotted owls, construction and routine maintenance activities will not occur from February 1 through July 31 within an area around nest sites encompassing a 500-acre buffer area, as required by the Mexican Spotted Owl Recovery Plan (USFWS 1995).
34	Boreal toad surveys will be conducted in all suitable breeding habitat within 0.5 mile of the selected alternative during the breeding season (May 15 to July 15) prior to construction. Pending further discussion with the USFWS, if boreal toads are detected, the occupied breeding habitat and a 900-foot buffer area may need to be avoided at all times.
35	An aerial survey for nesting raptors will be conducted during the spring prior to construction within 0.5 mile of the selected alternative. To protect nesting raptors, construction activities will not occur from March 15 through July 31 within 0.5 mile of active raptor nests.
36	To protect wintering bald eagles, construction and routine maintenance activities will not occur within the bald eagle daytime concentration area or within one mile of known daytime or nocturnal roost sites from November 15 through April 15.
37	To protect nesting bald eagles, construction and routine maintenance activities will not occur within one mile of known nest sites from November 15 through July 31.
38	The holder will submit a plan of development that describes in detail the construction, operation, maintenance, and termination of the right-of-way and its associated improvements and/or facilities. The degree and scope of these plan(s) will vary depending upon the complexity of the right-of-way or its associated improvements and/or facilities, the anticipated conflicts that require mitigation, and additional technical information required by the authorized officer. The plan(s) will be reviewed, and if appropriate, modified and approved by the authorized officer. An approved plan of development will be made a part of the right-of-way grant.

Purpose and Need Issues. Studies conducted for the distributed generation alternatives concluded that a properly designed and operated distributed generator could provide both emergency power backup to the Telluride Area and regional benefits to Tri-State's southwest load servicing capability. Results of power flow modeling studies conducted by Tri-State (Tri-State 2000d) and independently reviewed by AESC are summarized in *Table 2.2-6*. The modeling studies concluded that a 30 MW generator would allow Tri-State to transfer up to 15 MW of power across the southwestern Colorado grid system (termed 'TOT2A'), and also provide up to 10 MW of power for southwestern Colorado loads.

Table 2.2-6
Regional Benefits Comparison

	Nucla-Telluride 115 kV Line Upgrade	Telluride 30 MW Distributed Generation
TOT2A	+15 MW	+15 MW
SW CO Load Serving	+30 MW	+10 MW
(Tri-State, July 2000)		

Siting Issues. For the purposes of the EIS analysis, the evaluation of the distributed generation alternatives is based upon potential sites that are considered technically viable. Four sites were identified as technically viable. These sites are shown in ***Figure 2.2-2*** and meet the technical qualifications of:

- Proximity to the Telluride Load Center
- Adequate undeveloped space
- Availability of fuel (natural gas or liquid gas)
- Proximity to the high voltage electric grid.

Since this type of alternative is not being proposed by Tri-State, it is not the intent of this EIS to identify a preferred site nor evaluate detailed engineering and design issues for a given locale. Rather, these alternative sites are conceptual, and are included for the purposes of the EIS analysis and comparison of tradeoffs among the alternatives. *Table 2.2-7* provides a summary of the alternative generator site characteristics.

2.2.2.2 DESCRIPTION OF GENERATION ALTERNATIVES

The three distributed generation alternatives are described below. Issues discussed include: the underlying objective considered in developing the alternative, the size and type of generator that is considered appropriate, the operating hours and conditions assumed, fuel type and availability, and the other modifications to transmission systems, substations and/or distribution lines that would accompany each alternative. Finally, the degree to which the alternative could meet the stated Purpose and Need in Chapter 1.0 is summarized.

Large Generator Alternative

The Large Generator Alternative was developed to document the size and type of facilities that would be required to achieve the following Project and public objectives:

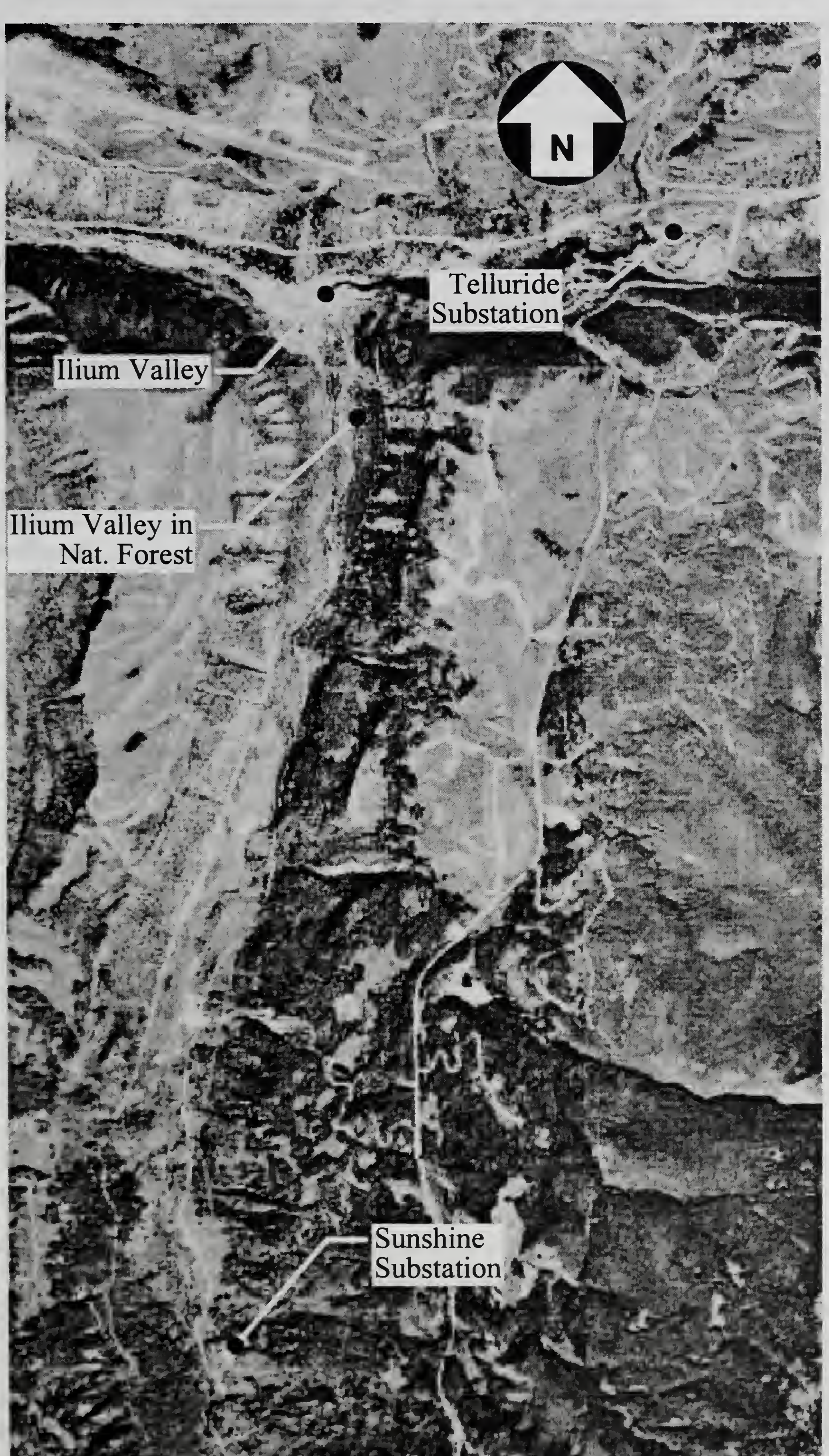

Figure 2.2-2
Possible Generator Sites

Table 2.2-7
Summary of Generator Site Characteristics

Site Name	Location Description	Approximate Available Area	Qualifications	Possible Issues
Telluride Substation	Area adjacent to the west side of the Telluride Substation. Immediate area owned by SMPA. Additional area to the north is owned by San Miguel Valley Corporation (SMVC).	-1 Acre, SMPA +3 Acres, SMVC	Site is adjacent to Telluride Substation permitting access to high voltage interconnection. High-pressure natural gas within 150 yds. Near Highway 145, makes liquid fuel delivery possible.	SMPA has indicated that they have plans for a new maintenance facility to be built on the available space. Acquisition cost for adjacent SMVC land may be high because of current market value.
Ilium Valley	Site is in the Ilium Valley just south of Highway 145 off of 625 Rd. and west of the Sunshine Valley Condominiums. The largest plot in this area is owned by Telecam Partnership II (TPII).	-1 Acre, TPII	Near high voltage lines from Nucla and Sunshine Substations. High-pressure natural gas within 50 yds. Road access is adequate for liquid fuel delivery.	Close proximity (300 yds.) to condominiums. Lack of existing electrical bus to interconnect with grid.
Ilium Valley in National Forest	Also in Ilium Valley, ¾-mile south of Highway 145 off of 625 Rd., just inside the National Forest boundary.	-2 Acres, UNF	Near Sunshine-Telluride high voltage line. With improvements, road may be adequate for liquid fuel delivery. High-pressure natural gas service is approximately ½-mile away.	Need right-of-way for natural gas service line.
Sunshine Substation	Four miles south of Highway 145, in the Ilium Valley within the UNF. Available area is adjacent to and south of Sunshine Substation. Assumed that SMPA is leasing land from USFS. Additional space in surrounding UNF.	-1 Acre, SMPA	Near Sunshine Substation for high voltage interconnection.	Natural gas is almost four miles away. Inadequate road for liquid fuel delivery. High sensitivity to noise from nearby development.

1. Meet Tri-State's objectives of providing both local power reliability and bulk power transfer capability within southwestern Colorado

2. Cause no changes to the pole size and design across Specie, Wilson and Sunshine Mesas. Under this alternative, the existing 69 kV line would be rebuilt as a 69 kV line between Nucla and Norwood. From Norwood to Sunshine, the line would either be converted to a distribution line or removed. In either case, the existing 13 MW of power currently provided by the 69 kV line configuration would no longer be available to the Telluride Area in the event of an outage on the Hesperus-Telluride Line.

Generator Size and Type. A 40 MW industrial gas turbine was assumed for this alternative. The EIS analysis for this scenario is based on a 40 MW class GE MS60001B (also known as a 'Frame 6B). A photo of a similar generator is shown in *Figure* 2.2-3. At Telluride's altitude and winter ambient temperatures, the generator would be derated to a 33.1 MW capacity. This type of generator would be approximately 95 feet long, 35 feet wide and 25 feet tall on average. The height of the stack and inlet filter would reach approximately 50 feet. Approximately 1.5 to 3.0 acres would be required for this type of alternative and would vary depending upon access conditions and topography. This unit would be equipped with a blackstart diesel engine in order to start up the generator without electricity from the existing power grid.

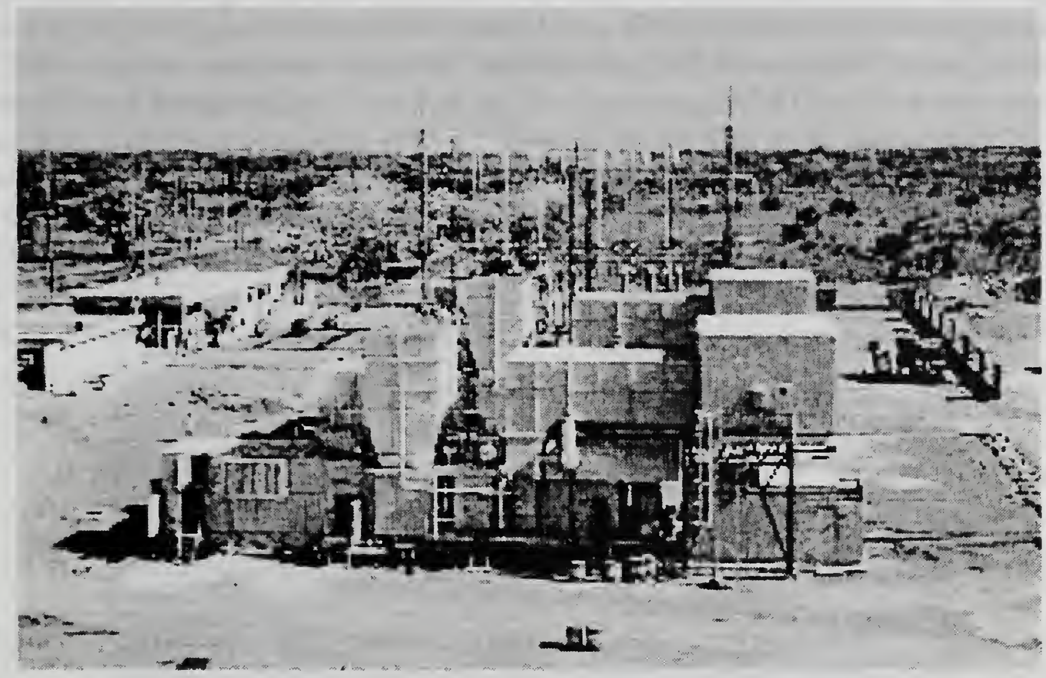

Figure 2.2-3
External Picture of Two Installed GE Frame 6B Gas Turbines

Operating Conditions. The Large Generator Alternative would be operated for two purposes: to provide backup power in the event of an outage on the Hesperus-Telluride transmission line, or to provide regional transmission grid congestion relief. For transmission line outages, the unit would operate as an emergency power source and would need to start shortly after detecting an outage. For regional transmission grid benefits, the generator would be scheduled to operate, allowing time to notify the natural gas utility so that fuel gas was available when the unit started. It is estimated that this type of unit would initially operate 364 hours per year. Annual operations would increase over time as growth occurred in the region and regional grid requirements escalated. By the year 2020, this alternative would be expected to operate approximately 1,688 hours per year (AESC 2000).

Fuel Type and Availability. Fuel for the Large Generator Alternative is assumed to be natural gas. This type of fuel is locally available from Kinder Morgan's 6" line that extends from the west and is located near SMPA's Telluride Substation. Since a natural gas fuel generator would require a substantial increase in the volume of gas flowing through the pipeline near Telluride, Kinder Morgan has indicated that a 1,100-horsepower compressor would be required at Redvale. Depending upon the location of the generator, extensions from the existing pipeline to the generator could vary in length. Limited amounts of diesel fuel would also be used for initial startup.

Transmission Line and Substation Modifications. Under the Large Generator Alternative, the existing 44/69 kV line would be rebuilt by SMPA to present-day standards between the Nucla Substation and the Norwood Substation. Between Norwood and Sunshine the existing line

would either be removed or converted to a distribution line by SMPA. SMPA would continue to repair and replace poles and hardware as needed to ensure reliable power to residents of the mesas. Two 5 MVAR capacitors would also be added at the Telluride Substation. Although underground distribution service could technically be provided by SMPA from the Telluride Substation, SMPA has stated that they would retain this line and easement for distribution service, as a matter of policy. Other changes to SMPA's distribution system and substation facilities would be similar to those described for the Nucla-Norwood Alternatives (See Section 2.2.1 and ***Plates PROJECT-3, -4, and -5***).

Purpose and Need. The 40 MW generator would provide sufficient capacity to meet the purpose and need objectives summarized above, and also provide sufficient capacity to meet the projected annual peak demands of 32.1 MW in the Telluride Area by the year 2021. Modeling studies indicate that with a 40 MW generator, an additional 17 MW could be transferred across the regional TOT2A power grid and an additional 11 MW of power could be available to serve loads in southwest Colorado during periods of congestion (AESC 2000). Although this alternative would provide for these local needs and benefits, the residents of Norwood, Redvale and Wrights Mesa would not benefit from this alternative. With the Large Generator Alternative, customers served by the Nucla-Norwood 69 kV line would be on a 'radial' line. This means that these customers would not have any backup source of power in the event of an outage on this line. As a consequence, the quality of service and availability of backup power would be worse than it is today.

Small Generator Alternative

The Small Generator Alternative was developed to document the size and type of facilities that would be required to achieve the following Project and public objectives:

1. Meet Tri-State's objectives of providing both local power reliability and bulk power transfer capability within southwestern Colorado

2. Minimize the size and operating conditions of the generator, while still meeting the purpose and need objectives outlined in Chapter 1.0

Under this scenario, the existing Nucla-Sunshine 69 kV line would initially remain in operation as it is today, but would ultimately be rebuilt to present day 69 kV design standards. According to SMPA, the existing 69 kV line would be maintained as long as possible, until maintenance costs and reliability problems become unacceptable. (Tri-State and SMPA, July 2000). Based on the maintenance and reliability record of this line, SMPA anticipates that the Nucla-Sunshine 69 kV line would need to be completely rebuilt within 10 years. Consequently, under this plan the 69 kV line would continue to provide 13 MW of power, until it is rebuilt to present-day standards. Once the line has been rebuilt, its capacity would increase to approximately 34 MW. Under this scenario, the EIS analysis assumes that only 13 MW of backup power would be available for the next 10 years. Changes to the pole size and design across Specie, Wilson and Sunshine Mesas would ultimately occur, however, and be similar to the proposed 115 kV line. (See Section 2.3.2, 69 kV Rebuild Alternative discussion for more information.) The power that would be provided by the rebuilt 69 kV line would be available to the Telluride Area in the event of an outage on the Hesperus-Telluride Line.

Generator Size and Type. The Solar Titan 130 gas turbine generator was identified by AESC as the model best suited for this scenario. Two units would be required and were assumed to be installed in 2002 and 2005. The Titan 130 is a high efficiency industrial gas turbine utilizing state-of-the-art dry low emission combustion technology. The rated capacity of the Solar Titan

130 gas turbine generator is 10.9 MW. The combined capacity of two generators would be approximately 20 MW.

In combination with the capacity of the Nucla-Sunshine 69 kV line, two generators of this size would meet the purpose and need objectives, and also provide sufficient capacity to meet the Telluride Area's year 2021 projected annual peak demands of 32.1 MW. A photo of a similar scale generator compressor is shown in ***Figure 2.2-4***. This type of generator would be approximately 48 feet long, 14 feet wide and 13 1/2 feet tall on average. The height of the exhaust stack would increase the unit's total length to 54 feet and height to 25 feet. Approximately 1.5 acres would be required for this alternative but could vary somewhat depending upon access conditions and topography. This unit would not be equipped with a blackstart diesel engine, since the existing Nucla-Sunshine line would be available to provide power for starting the generator.

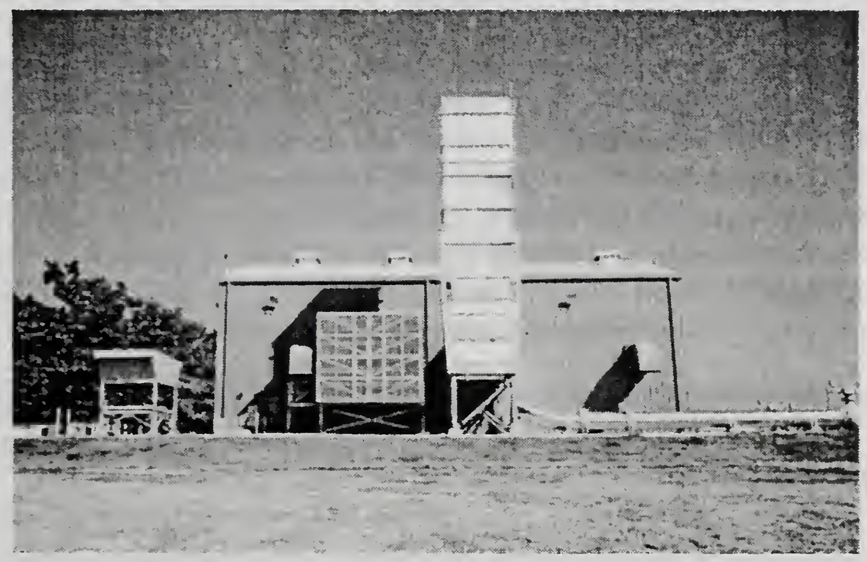

Figure 2.2-4
Representative Scale of a Solar Titan 130 Gas Turbine Generator

Operating Conditions. The Small Generator Alternative would be operated for two purposes: to provide backup power in the event of an outage on the Hesperus-Telluride transmission line, or to provide regional transmission grid congestion relief. For transmission line outages, the unit would operate as an emergency backup power source and would need to start shortly after detecting an outage. For regional transmission grid benefits, the generator would be scheduled to operate, allowing time to notify the natural gas utility so that fuel gas was available when the unit started. It is estimated that this type of unit would initially operate 364 hours per year. Annual operations would increase over time as growth occurred in the region and regional grid requirements escalated. By the year 2020, this alternative would be expected to operate approximately 1,688 hours per year (AESC 2000).

Fuel Type, Availability. Fuel for the Small Generator Alternative is assumed to be natural gas. This type of fuel is locally available from Kinder Morgan's 6" line that extends from the west and is located near SMPA's Telluride Substation. Since a natural gas fuel generator would require a substantial increase in the volume of gas flowing through the pipeline near Telluride, Kinder Morgan has indicated that a 1,100-horsepower compressor would be required at Redvale. Depending upon the location of the generator, extensions from the existing pipeline to the generator could vary in length. Limited amounts of diesel fuel would also be used for initial startup.

Transmission Line and Substation Modifications. Under the Small Generator Alternative, the existing Nucla-Sunshine 44/69 kV line would ultimately be rebuilt by SMPA to present-day 69 kV

standards between the Nucla Substation and the Sunshine Substation. For the foreseeable future (approximately 10 years) SMPA would continue routine maintenance on the 44/69 kV line and replace poles and hardware as needed. Long-term, however, SMPA would rebuild the line to present day standards. Consequently, changes to pole size and design across Specie, Wilson and Sunshine Mesas would occur, and be similar to the proposed 115 kV line. Average pole heights for a 115 kV transmission line range from 65 to 88 feet, compared to present-day 69 kV design with typical pole heights between 57 and 88 feet. Overall, the rebuilt 69 kV line poles would be approximately twice as tall as the existing 44/69 kV poles.

Power provided by the rebuilt 69 kV line would be available to the Telluride Area in the event of an outage on the Hesperus-Telluride Line. Two 5 MVAR capacitors would also be added at the Telluride Substation. Other changes to SMPA's distribution system and substation facilities would be similar to those described for the Nucla-Sunshine 115 kV Alternative (Section 2.2.1 and ***Plates PROJECT-3, -4, -5*** and ***–6***.)

Purpose and Need. Similar to the Large Generator Alternative, the Small Generator Alternative could provide for both emergency backup power to the Telluride Area and regional benefits to Tri-State's southwest load servicing capability. Modeling studies indicate that an additional 6 MW could be transferred across the regional TOT2A power grid, or that an additional 4 MW of power would be available to serve loads in southwest Colorado (AESC 2000). Since this alternative would allow the existing line to provide 13 MW of power, it would also result in benefits in power reliability and quality of service to residents of Norwood, Redvale and Wrights Mesa that are served by the Nucla-Norwood transmission line.

Emergency Generator Alternative

The Emergency Generator Alternative was developed to document the size and type of facilities that would be required to achieve the following Project and public objectives:

1. Meet Tri-State's objective of providing local power reliability
2. Minimize the size and operating conditions of the generator, while still providing for backup power to the Telluride Area

Assumptions regarding the existing 44/69 kV line are the same as described above for the Large Generator Alternative. Under this scenario, the existing 44/69 kV line would be rebuilt to present- day standards between the Nucla and Norwood Substations. Between Norwood and Sunshine the line would either remain as is and be used as a distribution line, or be removed. The EIS analysis of the Emergency Generator Alternative assumes that 13 MW of backup power would continue to be available from the Nucla-Sunshine line.

Generator Size and Type. The generators assumed for the Emergency Generator Alternative are the same as described above for the Small Generator Scenario -- the Solar Titan 130 gas turbine generator. Two units would be required and were assumed to be installed in 2002 and 2005. The Titan 130 is a high efficiency industrial gas turbine utilizing state-of-the-art dry low emission combustion technology. The rated capacity of the Solar Titan 130 gas turbine generator is 10.9 MW. A photo of a similar generator is shown in ***Figure 2.2-4***. The combined capacity of two generators would be approximately 20 MW.

Operating Conditions. The Emergency Generator Alternative would be operated for one purpose: to provide backup power in the event of an outage on the Hesperus-Telluride transmission line. Routine maintenance start-ups would also be required on a regular basis, estimated at approximately 24 hours per year. Total annual operations are estimated at 48 hours. For transmission line

outages, the unit would operate as an emergency backup power source and would start shortly after detecting an outage. It is estimated that this type of unit would need to operate, during emergencies, 248 hours per year.

Fuel Type, Availability. Fuel for the Emergency Generator Alternative is assumed to be natural gas. This type of fuel is locally available from Kinder Morgan's 6" line that extends from the west and is located near SMPA's Telluride Substation. Since a natural gas fuel generator would require a substantial increase in the volume of gas flowing through the pipeline near Telluride, Kinder Morgan has indicated that a 1,100-horsepower compressor would be required at Redvale. Depending upon the location of the generator, extensions from the existing pipeline to the generator could vary in length. Limited amounts of diesel fuel would also be used for initial startup.

Transmission Line and Substation Modifications. Changes to SMPA's existing 44/69 kV line and substations would be the same as described above for the Small Generator Alternative.

Purpose and Need. All assumptions for the Emergency Generator Alternative are the same as for the Small Generator Alternative, except the hours of operation. The Emergency Generator Alternative would only be operated to provide emergency backup power to the Telluride Area; and would not be operated to meet Tri-State's needs to increase load-serving capability in southwestern Colorado or to alleviate regional congestion on the TOT2A grid system. Consequently, this alternative assumes that load-serving capability would not increase and no increase in power transfer capability across the TOT2A system would result.

2.2.2.3 COSTS OF GENERATION ALTERNATIVES AND COMPARISON TO TRANSMISSION ALTERNATIVES

The costs of the three types of distributed generation alternatives are shown in *Figure 2.2-5*. Cost savings that could potentially be realized by using refurbished equipment ('w/Economies') are also indicated. *Figure 2.2-5* provides an overall comparison of distributed generator alternative costs with the proposed transmission alternatives.

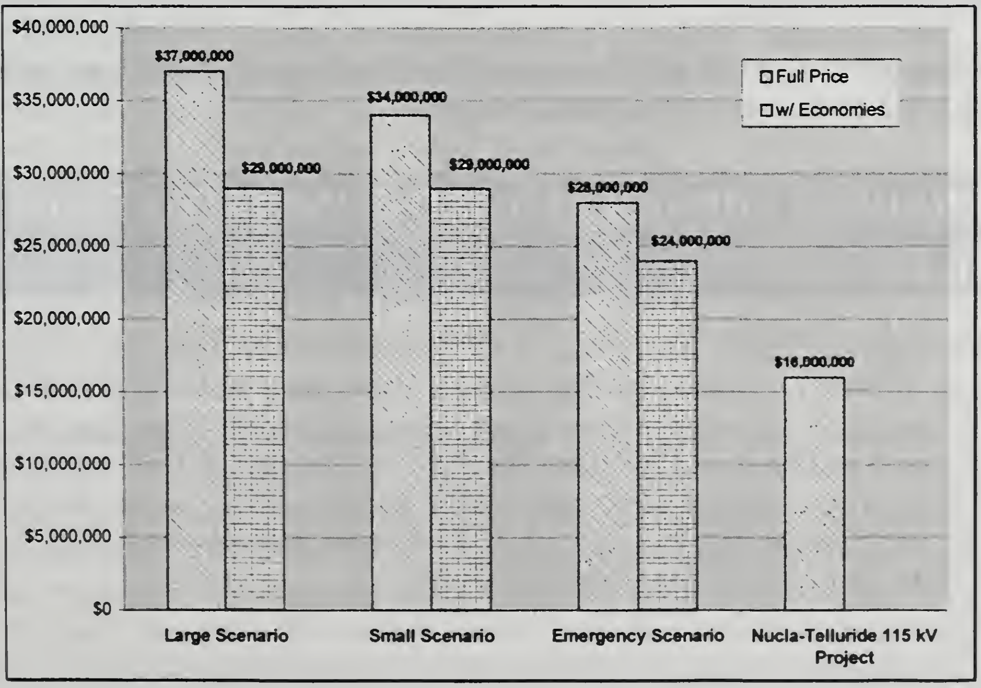

Figure 2.2-5
Comparison of Generator and Transmission Line Present Value Costs

Overall costs for the Distributed Generator Alternatives range between $18,829,689.00 and $36,531,483.00. These costs vary by (1) generator alternative and equipment specifications, (2) the degree to which the existing 69 kV line would need to be rebuilt, and (3) whether new or refurbished generators would be used. In comparison, the present value cost for the proposed 115 kV line is estimated at $15,631,918.00 (AESC 2000).[3]

2.2.2.4 SUMMARY COMPARISON OF REGIONAL BENEFITS ASSOCIATED WITH GENERATION AND TRANSMISSION ALTERNATIVES

Table 2.2-8 compares the regional benefits of the Distributed Generator Alternatives with the proposed 115 kV Transmission Project. In summary, although the Large Generator Alternative was found to meet the need of increased power reliability in the Telluride Area, and could provide increased regional benefits, this alternative would not increase the reliability of power, or quality of service to residents of Norwood, Redvale or Wrights Mesa.

Table 2.2-8
Comparison of Regional Benefits

	TOT2A Transfer Benefit	SW Colorado Load Serving Benefit
115 kV Nucla-Telluride Line	15 MW	30 MW
Large Distributed Generator Scenario	17 MW	11 MW
Small Distributed Generator Scenario	6 MW	4 MW
Emergency Generator Scenario	0 MW	0 MW

With the Small Generator Alternative, all customers would benefit, since the existing 69 kV line between Norwood and Sunshine would remain and ultimately be rebuilt to present-day 69 kV design standards.

Finally, the Emergency Generator Alternative would only provide benefits to Telluride, while other customers in Norwood, Redvale and Wrights Mesa would have reduced power reliability. These customers would be on a radial line and subject to increased power outages, compared to conditions today.

In comparison, the proposed 115 kV Transmission Line Project would provide the greatest benefits to both local residents and regional needs.

2.3 ALTERNATIVES CONSIDERED AND ELIMINATED FROM DETAILED STUDY

A number of alternatives to the proposed 115 kV transmission line were suggested during scoping including different locations for the Project, alternative technologies and voltages, and conservation measures. Suggested alternatives were reviewed according to whether they would meet the stated purpose and need for the Project (Chapter 1.0). These alternatives were also evaluated as to whether they were reasonable and practical, in accordance with NEPA and Clean Water Act, Section 404 regulations. This section discusses why the following types of alternatives were eliminated from detailed study:

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[3] *It should be noted that all costs presented in the EIS are estimates only for purposes of comparison, and are based on the criteria used by AESC. Actual costs of a DG Alternative would vary, and would include additional costs for shipping, surveying, site preparation, auxiliary substation equipment, training, sales tax and permitting. Tri-State estimates that these types of additional installation costs could be as much as $3 to $4 million. Tri-State's O&M cost estimates are an additional $3 million on a present worth basis.*

- **Routing Alternatives** - including other alternative routes between the Nucla-Norwood and Norwood-Sunshine/Telluride Substation interconnections
- **Alternative Voltages and Systems** - including rebuilding the 69 kV line; interconnecting with the 230kV voltage lines on Beaver Mesa and undergrounding the 115 kV line along its entire length
- **Renewable Energy Systems** - including hydroelectric, solar, wind
- **Energy Conservation** - including Demand Side Management (DSM)

2.3.1 ROUTING ALTERNATIVES

A number of routing options were identified during the scoping process. Routes initially considered and later dropped from consideration are shown in ***Plate PROJECT-9***. Routes were eliminated due to a combination of environmental, land use, and visual issues. In general, alternative routes to the existing 69 kV Nucla-Sunshine line were not considered unless they would reduce or avoid potentially significant land use or environmental impacts that would result from rebuilding the line in its current location. Alternative routes were also rejected in instances where an alternative's increased length would result in substantially greater environmental conflicts. In a number of cases, route segments were dropped because they were adjacent to, and/or required for other link segments that were eliminated for reasons described above.

Alternative Routes Between Nucla and Norwood - Three routes were suggested between the Nucla and Norwood substations, as well as a number of localized routes in the vicinity of the Norwood Substation (***Figure PROJECT-9***). The northern alternative across Wrights Mesa and Mailbox Park was primarily eliminated due to potential conflicts with bald eagle roosting sites along the San Miguel River and on BLM land. This alternative would also establish a new right-of-way across developing subdivisions and irrigated agriculture, where long-term land use impacts could occur.

Two southern alternatives between the Nucla and Norwood substations were also eliminated: one that generally followed county roads wherever possible, and one that paralleled the boundary between the Uncompahgre National Forest and BLM lands. These alternatives were essentially consolidated to become the Nucla-Norwood Southern Alternative, which maximized the use of existing access across public BLM lands.

A number of localized alternatives were initially considered in the vicinity of the Norwood Substation. Each of these alternative routes would result in visual impacts to local residents; and none were found to substantially avoid or reduce impacts compared to the existing 69 kV line. Consequently, these alternative routes were eliminated in response to the public concerns expressed during scoping.

Alternative Routes Between Norwood and Sunshine/Telluride - During scoping two routing alternatives that crossed the BLM's San Miguel River Canyon ACEC near Beef Trail Road were considered. According to the BLM's Resource Management Plan Amendment for the San Miguel River Canyon ACEC and SRMA (BLM 1991), only one transmission corridor may cross the ACEC: either along the existing 69 kV line corridor or near the southern boundary of the ACEC near Beef Trail Road. Early-on, two alternative routes near the southern boundary of the ACEC were identified - one that would pass in a northwest to southeast direction across a portion of the Uncompahgre National Forest, and one that would parallel the Lone Cone Road. Both of these alternatives were eliminated due to the increased length of the line and associated ground disturbances, as well as the extensive land use conflicts and visual impacts that were expressed by local residents during scoping.

Localized alternatives near the Norwood Substation were also evaluated and eliminated for the same land use and visual impact reasons as noted above for the Nucla-Norwood Alternatives. Localized alternatives were also explored in the vicinity of Specie Mesa. Since none of these options would substantially reduce the visual effects in this area, they were eliminated from further consideration.

An alternative was also considered early on across Bilk Creek. This routing option was initially considered as a way to provide a connection to the Telluride Substation, which would allow an existing 115 kV line to be removed in Ilium Valley, between Sunshine and Telluride. This alternative was eliminated due to the significant impacts to natural biological habitats and sensitive views that would occur. The biological sensitivity of the Bilk Creek Area has been recognized by various conservation groups, including The Nature Conservancy; and its sensitivity is attributable to the high quality and pristine undisturbed condition of natural vegetation and wildlife habitat in the canyon. With respect to visual sensitivity, the Bilk Creek area is highly visible from the Telluride Airport and nearby homes in Aldasoro Ranch, as well as the SR 145 Scenic Byway. Visual impacts to natural scenic quality and sensitive viewers would be high. Consequently, in light of both the potential biological and visual impacts, this alternative was eliminated from further consideration.

San Miguel River Canyon Alternative – An alternative that would utilize the existing powerline corridor along the San Miguel River Canyon was suggested during the public review period on the Draft EIS. As shown in Volume II, ***Plate LAND-2***, SMPA has an existing distribution line parallel to the San Miguel River and SR 145 from east of Norwood to the Telluride Area. This distribution line is typically 40 to 45 feet in height and is routed immediately adjacent to the river and/or the highway for most of this distance.

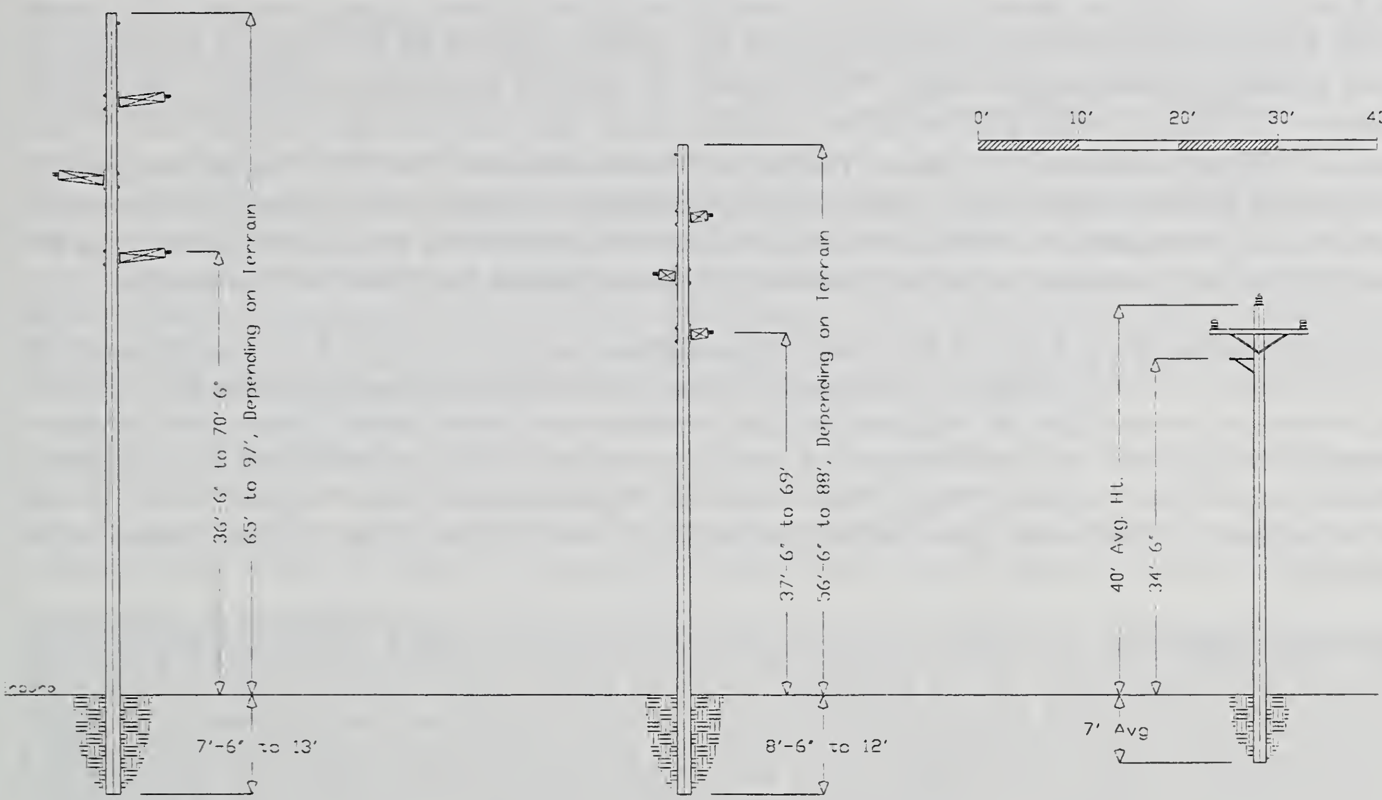
This alternative was reviewed early-on during the identification of alternative routes and was eliminated from detailed consideration for a variety of natural and human resource concerns. Placement of the proposed 115 kV transmission line immediately adjacent to the river and highway would have significant long-term effects on the river canyon and its qualities, as well as the Unaweep-Tabeguache Scenic and Historic Byway and the San Juan Skyway National Scenic Byway. Direct and indirect impacts to the river would include loss of wetlands and related wildlife habitat qualities and increased sedimentation in the river from construction activities. Due to the important natural values along the San Miguel River Canyon, the BLM has designated it as an Area of Critical Environmental Concern (ACEC) (see EIS, Volume I, Sections 3.8 and 3.9, and Volume II, ***Plate REC-1***). As such, the proposed transmission line is not compatible with the management objectives of the BLM along the canyon.

Impacts to the national scenic byway would also be very significant, since the taller 115 kV poles would be located immediately adjacent to Highway 145 in most sections, and would thus be highly visible and contrast with the natural setting of the canyon. These types of significant visual impacts would occur along approximately 25 miles of the scenic byways, thereby affecting views for 30 to 40 minutes of driving time. Other values that would be significantly affected by the placement of the 115 kV transmission line along the river canyon include: the Specie Creek and Beaver Creek Boat Launch Areas and lands managed by the Nature Conservancy. Due to the numerous significant conflicts of the proposed 115 kV transmission line with the San Miguel River Canyon, this type of an alternative was eliminated early-on from further consideration.

2.3.2 ALTERNATIVE VOLTAGES AND SYSTEMS

69 kV Rebuild. Rebuilding the 69 kV line along the existing Nucla-Sunshine right-of-way was suggested by numerous persons during scoping as a way to avoid or minimize visual impacts from the proposed 115 kV Project. In general, members of the public suggested this alternative

as a way to provide greater or more reliable power to the local area, while not significantly changing the existing character of the Nucla-Sunshine line. *Figure 2.3-1* shows the comparative scales of the 115 kV and 69 kV poles. This alternative was eliminated from detailed consideration in the EIS analysis since it would not fulfill the purpose and need for increased reliability of power and load serving capability to the degree possible with the proposed 115 kV system.



115 kV Single Circuit Structure
Single Wood Pole – Tangent
Avg. Height: 70 ft.

69 kV Single Circuit Structure
Single Wood Pole – Tangent
Avg. Height: 56 ft. 5 in.

Existing 44/69 kV Structure
Single Wood Pole – Tangent
Avg. Height: 40 ft.

Figure 2.3-1
Comparison of Industry Standard Structures and Existing Nucla-Sunshine 44/69 kV Structures

Industry design standards for 69 kV lines have changed substantially over the last 50 years. Rebuilding the 69 kV line to present-day standards would be required by RUS in order for SMPA to qualify for financing. Using present-day design standards would also be necessary in order to improve the reliability of this line by providing a shield wire for lightning protection. As discussed in Chapter 1.0, the existing Nucla-Sunshine 69 kV line is highly susceptible to lightning strikes, due to its location on the high mesas and its lack of a shield wire for protection. Consequently, in order to qualify for financing and improve the reliability of this line, a present-day design standard would be used.

A typical 69 kV pole design considered acceptable by RUS and the proponents is shown in *Figure 2.3-1.* The 69 kV conductor would be supported on single wood poles, ranging in height from 56 feet to 88 feet. According to Tri-State, the average height of the 69 kV pole would be 56'5". In comparison, the existing 69 kV line is supported on single poles that average 35 to 40 feet tall. With its greater height, the modern 69 kV pole design provides sufficient distance between its diagonally spaced conductors to protect perching raptors from electrocution. The new design contributes to higher reliability by including a shield wire, for lightning protection, at the top of each pole. Greater pole height is also required in order to maintain

adequate ground clearance while at once increasing average pole spacing to 450 feet, similar to the proposed 115 kV line, and reducing the total number of structures.

The capacity of the 69 kV Rebuild Alternative would be 34 MW. This alternative would have sufficient capacity to meet the 2015 peak demand for the Telluride Area (30 to 32 MW) but would not have sufficient capacity to provide full backup power for SMPA's service area (44.7 MW). In addition, the 69 kV Rebuild would not alleviate the regional system deficiencies to the degree achieved by the proposed 115 kV system. With a 69 kV Rebuild Alternative, other system improvements would be necessary to remedy regional overloads. The Nucla-Cahone 115 kV line would have to be reconductored and the Cahone-Empire 115 kV line would need to be uprated (see ***Figure P&N-1***). The reconductoring of the 43-mile long Nucla-Cahone 115 kV line would entail replacing the existing conductor, which would be done with ground equipment and vehicles. Uprating the Cahone-Empire line would entail changing the way this line is operated, but entail no new physical changes or ground disturbances.

In summary, the 69 kV Rebuild Alternative was eliminated from detailed consideration since this alternative would result in substantially greater visual effects than the existing 69 kV line, and would not meet either the regional or local purposes and need of the Project. Furthermore, ground disturbances for this alternative would be measurably greater than the proposed Project, since the 43-mile long Nucla-Cahone transmission line would need to be reconductored at the same time the Nucla-Sunshine 69 kV line, poles and hardware were replaced.

Underground Alternative. Undergrounding the 115 kV line was suggested during scoping as a way to avoid the visual effects of the proposed overhead poles and conductors. Undergrounding portions of the line across Beaver, Specie, Wilson and Sunshine Mesas are addressed in this EIS, as described in Section 2.2.1. Undergrounding the line in its entirety was eliminated from detailed consideration, however, due to (1) the greater environmental impacts that this type of technology would cause in comparison to an overhead facility; (2) increased costs; and (3) the technical engineering constraints of crossing steep canyons and mountainous terrain.

An engineering feasibility study was conducted by Power Engineers (1999) that identified three types of potential cable installation systems: direct buried, duct bank and high pressure gas-filled cable systems. Construction techniques vary somewhat among technologies, however, ground disturbances would be similar overall.

An underground 115 kV transmission line would require pipe-type cable systems that would be installed in a continuous trench. The trench would be three to five feet wide and five feet deep, with the cables placed at least three and one-half feet below ground level. Sand and clean backfill would be used to refill the trench. The land over and in the vicinity of the line would have to be maintained free of trees and shrubs. Improved access would also be required for the length of the line. Cable splices would be required about every one-half mile.

The engineering feasibility of undergrounding the 115 kV line depends on terrain and geotechnical conditions. In general, underground technology is not considered feasible nor practical in areas characterized by mountainous terrain, steep slopes, extensive bedrock outcroppings, canyons and waterways due to both environmental and cost reasons. The short-term and long-term impacts of undergrounding to natural resources, including soils susceptible to erosion on steep slopes, increased sedimentation of waterways, and loss of natural habitats would be substantially greater than impacts caused by the overhead 115 kV poles.

For the line to be constructed underground, a continuous work area generally about 40 feet wide would be needed. Additionally, a new right-of-way might have to be acquired in areas where the line would deviate from the proposed right-of-way centerline because of obstacles such as wetlands, steep slopes, areas of high erosion, and areas of rocky terrain. In a number of situations,

wetlands probably could not be avoided. Transition stations would be needed for the line to switch between underground and overhead as necessary. These stations generally require an area about 200 feet by 200 feet (about 0.9 acres). Bus work, termination structures, and a control equipment building would be required at each site. Maximum structure height would be about 80 feet. Finally, operation and maintenance costs and periods of outage would be greater for an underground system than for an overhead system.

In addition to the technical feasibility issues, the costs of undergrounding the line for its entire length are extremely high in comparison to the overhead alternatives. On average, costs for undergrounding are 5 to 7 times higher than overhead costs (Power Engineers 1999).

Undergrounding the 115 kV line is considered technically and environmentally feasible in areas where access, terrain and geologic conditions are favorable. Such areas include portions of Beaver, Specie, Wilson and Sunshine Mesas. Specific areas of high visual sensitivity and scenic quality that would benefit from undergrounding include Link 13, mile marker 2.6 to 8.2 across Beaver Mesa, mile marker 10.5 to 14.3 across Specie Mesa; Link 14, mile marker 2.0 to 3.2 and Link 15, mile marker 0 to 1.3, 2.0 to 5.0 across Wilson Mesa; and Link 15, mile marker 5.3 to 5.9 across Sunshine Mesa. These areas are evaluated for undergrounding in the EIS.

In summary, the underground alternative, as a whole, was dismissed as being unfeasible and impractical due to environmental and technical factors. Undergrounding across flat valleys and mesas is considered technically feasible. For purposes of the EIS analysis, undergrounding across scenic portions of Beaver, Specie, Wilson and Sunshine Mesas is addressed further in Chapter 3.0.

Interconnections With 230 kV Lines. Two high voltage transmission lines traverse the Project area: Tri-State's Hesperus-Montrose 345 kV line and the Curecanti-Lost Canyon 230 kV line, that is owned and operated by Western Area Power Administration. An alternative raised by the public during scoping was whether it was feasible to tap into one of these existing lines. In order to meet the stated purpose and need for the Project, this alternative would entail the following system changes: 1) constructing a new substation on Beaver Mesa, where the existing high voltage lines cross the existing Nucla-Sunshine 69 kV line; and 2) replacing the existing 69 kV line with a 115 kV line between the new substation on Beaver Mesa and the Sunshine or Telluride Substations. With this alternative, the existing 69 kV line between Nucla and Norwood would still need to be rebuilt to present-day 69 kV standards. This alternative would cost between 15 and 17.4 million dollars depending upon whether the 230 kV or 345 kV lines were interconnected at the Beaver Mesa substation. This alternative was eliminated since it would not avoid most of the impacts of the proposed 115 kV transmission line and would cause additional impacts to sensitive wildlife species on Beaver Mesa.

2.3.3 RENEWABLE ENERGY SOURCES

A variety of renewable energy resources were suggested by the public during scoping, including hydroelectric power, solar, wind and energy conservation measures. These alternatives were eliminated since the technologies are not capable of meeting the stated Purpose and Need in Chapter 1.0.

Hydroelectric Technology. Hydroelectric power is generated by the passage of water through turbines. At present, there is one hydroelectric power plant near Telluride - the Bridal Veil hydro station. This facility is under contract to Public Service Company of Colorado and produces less than 500 kW. In addition, the San Miguel Hydroelectric Project is currently planned to be constructed on the San Miguel River, near Ilium. This facility has been permitted by FERC and the Town of Telluride, with construction set to commence by 2002. The capacity of this facility will be 4.6 MW.

Hydroelectric power, as an alternative to the proposed Project, was eliminated since these facilities will not have adequate capacity to meet the long-term local demand for backup reliability. In addition, due to the weather conditions and winter temperatures near Telluride,

this type of power source would not be available during the peak winter seasons, when the reliability of power to the region is at greatest risk.

Solar Technology. Solar energy in the form of photovoltaic cells is widely available for electric loads proportional in size to residential homes. Reducing long-term demand for power through the use of small-scale residential solar technology may be considered by local planning jurisdictions through their residential subdivision regulations or zoning. However, larger scale commercial production is currently in the development stages, and would entail photovoltaic panels that incorporate numerous cells in an array. The lack of a developed technology that could support the magnitude of backup power (32 MW) needed for the Telluride Area was a primary reason this type of technology was not carried forward for analysis. Additional limitations of this technology include its availability primarily during daytime hours and the need to convert solar energy to electric energy before it could be dispatched.

Wind Technology. Wind energy is produced by wind turbines. Wind power provides clean energy at a very low cost when installed. Today there are over 16,000 wind turbines that generate an estimated 1,500 MW of power. Adequate winds (i.e. greater than 11-mph wind speed) and available land are critical to the development of this type of renewable resource.

Tri-State currently buys wind generation from a Wyoming wind site under an interim purchase agreement with PacifiCorp. In late 1999, Tri-State began receiving up to 470 megawatt-hours per month of wind energy under long-term agreements with two other power providers: Cheyenne-based Terra Moya Aqua/Global Wind Energy Systems and Platte River Power Authority of Fort Collins, Colorado. They will provide 300 and 170 megawatt-hours per month, respectively to Tri-State. Customers may opt to purchase wind generated power by designating it on their monthly bills.

Wind energy is considered unfeasible for providing adequate backup power to the Telluride area, however, due to the highly variable nature of the winds and the visual impacts that such a development would impose on the region. Development of wind energy near Telluride would result in significant visual impacts due to the number of large wind turbines that would likely be required. Use of wind power produced in other areas such as Wyoming, would still require a transmission line for transmitting this energy resource.

Energy Conservation - Demand Side Management. Demand side management (DSM) programs are designed to reduce customer energy consumption. DSM practices are implemented by individual users and can be institutionalized at a local governmental level through building codes and other regulations. Typically, DSM has been shown to reduce energy demands by 10% to 20% depending upon the area and the types of incentives available (Tri-State 1999m). It is, therefore, reasonable to assume that 3 MW to 6 MW of Telluride's long-term power demand (32 MW) could be conserved with implementation of various DSM practices. This would result in a projected long-term winter peak demand of approximately 26 MW to 29 MW of power in the Telluride area.

Tri-State encourages its members to limit electric consumption during peak load periods by including a demand component in its wholesale electric rate. Places like Telluride have a time-of-use (TOU) rate available to its residents, and SMPA has a rate for direct controlled loads. During periods when peak loads cannot be met, SMPA has the ability to interrupt service to these loads in order to meet non-TOU customer demands for energy.

While energy conservation is encouraged as part of the area's energy plan, the implementation of DSM measures in conjunction with the existing Nucla-Sunshine 69 kV line (13 MW) would not be sufficient to meet the long-term winter peak demands in the Telluride area. Since this alternative would not meet the purpose and need of the region, it was eliminated as an alternative in the EIS.

2.4 NO ACTION ALTERNATIVE

The No Action Alternative is defined in this EIS as meaning there would be no improvements made, beyond routine maintenance, to improve reliability or the quality of service to those communities and surrounding areas that are currently served by the Nucla-Sunshine and Telluride-Hesperus transmission lines. Areas affected long-term by the No Action Alternative include the communities and surrounding areas of Norwood, Redvale, Telluride, Mountain Village, and residents of Wrights, Beaver, Specie, Wilson and Sunshine Mesas.

Under the No Action Alternative, the reliability of power to these communities and customers of SMPA would continue to diminish over time and the likelihood and duration of power outages would increase. Approximately 4,000 of SMPA's customers, who are served by the Nucla-Sunshine 69 kV line and Hesperus-Telluride 69/115 kV line, would be affected. SMPA would continue to perform routine and preventive maintenance on the 50-year-old Nucla-Sunshine line. Such maintenance would include replacing poles and hardware as these components fail or become unstable. In addition to an increase in the number and duration of power outages, the quality of service to residents of Norwood, Redvale, and the mesas would also continue to deteriorate over time.

Under the No Action Alternative, power outages in the Telluride Area would result if an outage on the Hesperus-Telluride transmission line occurs during peak winter conditions. Due to recent growth, the 13 MW available from the Nucla-Sunshine 69 kV line would be operated below standards, resulting in the low voltages or rolling blackouts until the Telluride-Hesperus transmission line is repaired. Repair times could range from days to weeks depending on terrain, weather, and snow pack conditions (Tri-State 1999n). An extended outage in the Telluride Area would pose a number of human health and safety risks to the community, as well as economic losses to businesses and tourism. The effects of the No Action Alternative are discussed in Chapter 3.0.

The No Action Alternative would also mean that regional system deficiencies would not be remedied, potentially resulting in system overloads. Maintenance of the Hesperus to Sunshine transmission line would also worsen since taking this line out of service would no longer be possible once power demands exceed the 13 MW capacity of the backup Nucla-Sunshine 69 kV line. Reductions in maintenance of these lines would, in turn, be expected to increase the pattern and duration of outages experienced over the past five years. In total, there have been 41 unscheduled outages on the Hesperus to Telluride line and 75 unscheduled outages on the Nucla to Sunshine line since 1996. This trend would continue and likely worsen. Finally, it should be noted that SMPA has stated that long-term, they would still need to replace the existing 69 kV system with a present-day designed 69 kV system (discussed in Section 2.3.2) if the proposed 115 kV transmission system is not permitted or built. Consequently, all costs associated with the short-term incremental replacement and repair of existing poles and hardware, and the long-term replacement of the entire system with a present-day 69 kV system, would be the sole responsibility of SMPA and their 10,000 customers.

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Chapter 3

The Affected Environment and Environmental Consequences of the Alternatives

3 THE AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES OF THE ALTERNATIVES

This section of the EIS explains the general approach used to document the existing conditions in the Affected Environment and to evaluate the potential Environmental Consequences of the Action and No Action Alternatives. The approaches to documenting Potential Mitigation Measures and Cumulative Effects are also disclosed.

3.1 ANALYSIS APPROACH

3.1.1 AFFECTED ENVIRONMENT

Chapter 3.0 sets forth the Affected Environment and Environmental Consequences of the project alternatives. This chapter addresses the social, economic, and environmental issues raised during scoping and during the public review of the Draft EIS. Issue statements are provided at the beginning of each section that summarize the relevant scoping comments from *Table 1.6-1*.

The Affected Environment sections describe the present conditions within defined 'project areas'. *Table 3.1-1* summarizes the environmental topics and associated project areas considered for the transmission and generation alternatives.

The Affected Environment descriptions are based upon: (1) a review of available sources, including existing technical documents, adopted federal, state and local planning documents, and previously prepared EISs; (2) interpretations of ortho-corrected 1997 aerial photography (scale 1:24,000) and topographic maps; (3) 1998 through 2000 field reconnaissances; and (4) consultation with federal, state and local agencies.

Available data sources for the project area included adopted federal and state resource management plans, adopted county plans, and databases available from federal, state, and local agencies and special interest groups. Existing Geographic Information System (GIS) databases were also reviewed for their application to the project area. Available GIS databases that cover various portions of the project area were compiled from files provided by the Forest Service Supervisor's Office for the Uncompahgre National Forest, by the BLM Montrose Southwest Center for BLM lands and parts of southwestern Colorado, by the Colorado Division of Wildlife for sensitive wildlife species, and by San Miguel County for land ownership.

Color aerial photographs of the regional project area were flown in September and October 1997. Photographs were produced at 1:24,000 and ortho-rectified using the ERDAS Imagine and OrthoMAX software products. Digital color imagery, consistent in scale and coverage for each of the U.S. Geological Survey 7.5-minute quadrangle maps, was subsequently produced. The GIS database for this project incorporates the existing available data files provided by the agencies and the updated information provided by the study team in 1998 through 2000. Specific data sources and collection methods used for the various resource topics are described in Sections 3.2 through 3.14 and are listed in Chapter 5.0, References.

3.1.2 ENVIRONMENTAL CONSEQUENCES

The Environmental Consequences sections analyze and explain the changes that can be expected from implementing the action alternatives and the no action alternative. This section forms the scientific and analytical basis for the EIS (Chapter 40 of the Code of Federal

Regulations (40 C.F.R 1502.14). It consolidates the discussions of those elements described in the purpose and need, scoping and alternatives development.

The Environmental Consequences sections disclose the following information:

- the analytical framework for each study
- the impacts of the primary alternatives
- the impacts of the subalternatives
- the effects of the no action alternative
- potential mitigation measures that may be effective in reducing impacts
- the residual environmental effects that would remain after mitigation
- cumulative effects.

Design, construction and operation practices committed to by Tri-State and/or required by the federal agencies (Section 2.1.1, *Tables 2.2-4* and *2.2-5*, and Appendix A) have been considered in the impact evaluations of the transmission alternatives and subalternatives.

Information available for assessing the generation alternatives is more general in nature (Section 2.1.2 and AESC, 2000). The scope of the impact analyses for the generation alternatives is intended to document the major issues and range of environmental effects that could result at viable generation sites, and for upgrading or maintaining the supporting transmission system that would still be required for the DG technology. This level of analysis allows EIS reviewers to understand and compare the magnitude of impacts and benefits from both the generation and transmission alternatives. Tri-State has stated they would not be the Project proponent of a distributed generation facility. Furthermore, the distributed generation alternative would constitute a "No Action" decision by the Forest Service. Consequently, the same level of information on facility siting, preliminary engineering, design and construction practices is not available for the generation alternatives and is beyond the scope of this EIS. It should be recognized, therefore, that the impact analysis for the distributed generation alternatives is conceptual and qualitative in nature; and focuses only on major environmental issues. *Table 3.1-1* indicates the environmental topics evaluated for the transmission and generation alternatives.

Table 3.1-1
Summary of Environmental Studies and Project Areas by EIS Alternative

EIS Section	Transmission Alternatives Project Areas	Generation Alternatives* Project Areas
3.2 Climate and Air	Regional Area	*Regional
3.3 Geology, Paleontology and Minerals	Alternative Corridors and .25 mile buffers	General vicinity issues
3.4 Soils	Alternative Corridors and .25 mile buffers	General vicinity issues
3.5 Water Resources	Alternative Corridors and .25 mile buffers	General vicinity issues
3.6 Biological Resources	Vegetation – Alternative Corridors; Wildlife – varies up to 2+ miles from corridors	General vicinity issues
3.7 Cultural Resources	Prehistoric and Historic Archaeological Sites – Corridors; Ethnographic (Native American) resources – general vicinity of project alternatives	Not evaluated
3.8 Land Use	Alternative Corridors and 0.5 mile buffers	General vicinity issues
3.9 Recreation	Alternative Corridors and 3.0 mile buffers	General vicinity issues
3.10 Visual Resources	Alternative Corridors and 3.0 mile buffers	*General vicinity issues
3.11 Socioeconomics	Regional Area	Regional Area issues
3.12 Transportation	Regional Area	Regional and Local area issues
3.13 Noise	Alternative Corridors and 0.5 mile buffers	*Project vicinity issues
3.14 Human Health and Safety	X – Alternative Corridors and .25 mile buffers	*Project vicinity issues

** Denotes major issues considered for distributed generation alternatives.*

3.1.2.1 ANALYTICAL FRAMEWORK

The analytical framework sections provide the reader information that is important to understand prior to reading the impact findings. These topics include:

- **Potential Types of Impacts.** The types of impacts that the construction, operation and maintenance of the project may cause to resources within the corridors are initially discussed. Relevant information from Chapter 2.0 is referenced in each of the resource sections and forms the assumptions used in each resource impact assessment.

- **Definitions of Impact Levels.** Qualitative levels that reflect relative degrees or intensities of impacts are defined on an individual resource issue basis. The following qualitative ranges and general definitions were used in evaluating the resource effects:

  High Impacts - High impacts would result where the construction, operation or maintenance of the alternatives would cause a substantial adverse effect to environmental resources of important social or natural value. High impacts were identified in instances where direct or indirect impacts would be sustainable and/or exceed thresholds considered acceptable or desirable by federal land management agencies and/or local jurisdictions and the public.

  Moderate Impacts - Moderate impacts would result if the construction, operation, maintenance or abandonment of the alternatives would potentially cause a noticeable change or stress to an environmental resource. Moderate impacts are typically identified in instances where direct or indirect impacts would be below the high effect thresholds, and of moderate intensity or extent.

  Low Impacts - Low impacts would result if the construction, operation, maintenance or abandonment of the alternatives would cause a minor change or stress to an environmental resource. Slightly adverse impacts were identified in instances where direct or indirect impacts would be of very limited extent, short duration or minor intensity.

  No Identifiable Effect - No identifiable effect is indicated where no measurable effect to the respective resource would occur.

  These general impact levels have been redefined for each resource issue to reflect the degree and severity of change that could occur. Resource specific impact definitions are provided in the Environmental Consequences discussion (Sections 3.2 through 3.13).

- **Applicable Permits, Standards and Ordinances.** The project would need to comply with various federal and state laws, and local standards and ordinances. The applicants would also be required to obtain various permits. This section provides the reader a listing of the applicable permits, standards and ordinances that would apply to subject resources.

- **Environmental Protection Measures (EPMs).** EPMs have been developed by Tri-State (Chapter 2.0 *Table* 2.2-4) and the Forest Service and BLM (Chapter 2.0, *Table* 2.2-5) to reduce, or minimize, impacts, where feasible. These measures would occur on private lands (*Table* 2.2-4) and public lands (*Table* 2.2.4 and 2.2.5) if the proposed transmission project is approved and constructed. Consequently, the EPM's are considered part of the transmission alternatives and subalternatives and are reflected in the assessment of impacts. Applicable measures that would help reduce impacts are referenced in the resource sections of this chapter.

3.1.2.2 IMPACT FINDINGS OF THE ACTION AND NO ACTION ALTERNATIVES

The Environmental Consequences findings are presented for (1) the primary transmission alternatives and subalternatives, (2) the distributed generation alternatives, and (3) the no action alternative. These findings are based upon an evaluation of how the construction, operation and maintenance of each alternative would affect resources, and the degree of those impacts (*e.g.* high, moderate or low) based upon the context and intensity of the changes. Where applicable, potential impacts are assessed based upon implementation of the EPMs and quantified, where possible, to account for the direct and indirect impacts of the alternatives. The quantification of impacts was developed from the project GIS databases. For resources that may be physically disturbed by the project (*e.g.* homes, agricultural fields, special-status and sensitive wildlife), the quantification of impacts is based upon the 'worst case' conditions along the alternative alignments. The alignments represent potential or likely locations for the 75-foot to 100-foot right-of-way, and are used for quantifying impacts for the various alternatives. The quantification of impacts along the alignments also allows a comparison to be made to the alternative of upgrading the existing 69 kV line to 115 kV in its current location. The degree to which impacts may be avoided during construction is discussed in the respective resource sections, and is based upon the distribution, size and location of the resource within the project areas or corridors. Impact disclosures for the expansion of the Norwood, Sunshine, Telluride, Specie Mesa and Wilson Mesa Substations account for the spatial areas directly and indirectly affected by the construction of the substation site grading.

3.1.2.3 CUMULATIVE EFFECTS

Under NEPA, the potential effects of the project in conjunction with other reasonable and foreseeable actions must be disclosed. For the purposes of this EIS, other potentially related past, present and future projects and actions were researched at the federal, state and local levels for the regional project area. The results of past actions form the basis for the affected environment. ***Figure CUMULATIVE-1*** lists the potential future actions that were considered in the cumulative analyses along with the affected environment. This figure also shows the general geographic location of these projects and actions. For each of the resource investigations, the potential cumulative effects of the project with these other actions were evaluated qualitatively. The area considered in the cumulative analyses varied by resource topic depending upon the potential for interaction or inter-relationships among these actions and the proposed project.

3.1.2.4 POTENTIAL MITIGATION MEASURES AND RESIDUAL EFFECTS

Potential measures that would be effective in reducing impacts to varying degrees are listed and described in this section. These measures extend beyond the adopted EPMs that have been committed to by Tri-State (throughout the project area) and the Forest Service and BLM (on federal lands only). EPMs that would be mandated on federal lands may be considered for private lands by the Counties or the individual, affected landowners. Mitigation recommendations presented in this section are potential measures only, and do not represent commitments on the part of the applicants, or federal lead and cooperating agencies. The degree to which these measures may be adopted for the project would be determined by the Forest Service, BLM and RUS in their respective RODs, and by Montrose and San Miguel Counties through their respective special use permit application processes. The residual effects of the project impacts are also disclosed in this section and describe the types and degrees of impacts that would remain after potential mitigation measures are applied to the various alternatives.

3.2 CLIMATE AND AIR QUALITY

ISSUES: Climate and air quality issues raised during scoping included:

Potential effects of the Project Alternatives on air quality and the Telluride Area's non-compliance with the Clean Air Act;

Potential air quality and visibility impacts to Class I or II Wilderness Areas;

Potential effects of severe winter conditions on power outages, emergency repairs, response times and access conditions.

3.2.1 AFFECTED ENVIRONMENT

CLIMATE

The climate of the project area is typical of the high plains and mountain areas of Colorado's Western Slope. As the elevation increases from the Nucla end of the project area to Telluride, temperatures decrease and precipitation amounts increase. The data summarized here was taken from a compilation of 30 years (1967-1997) of climatic data for Norwood, Placerville, and Telluride, Colorado, and may be found at *http://ccc.atmos.colostate.edu/cgi-bin/mlydb.pl.* on the Colorado Climatic Center's web site.

In this area, January is the coldest month of the year and July is the warmest month. Average annual temperatures range from almost 48°F. at Norwood to 40°F. at Telluride.

August is the wettest month of the year for both Placerville and Telluride, while July is the wettest month for Norwood. The average annual precipitation totals for Norwood, Placerville, and Telluride are 15.6, 17.3, and 23.4 inches, respectively. The total annual precipitation at Telluride is almost 50 percent greater than either Norwood or Placerville. This is typical of the effect mountainous terrain has on precipitation amounts. The influence that the terrain of the project area has on precipitation amounts is particularly noticeable when reviewing snowfall amounts. The average annual snowfall totals for Norwood, Placerville, and Telluride are 59.8, 77.7, and 201.9 inches, respectively. Snowfall total for Telluride is more than three times that of Norwood and more than two-and-a-half times that of Placerville. Severe winter conditions in this part of Colorado create exceptional hazards to powerlines, including the Hesperus-Telluride 115/69kV line. Chapter 1.0 describes the relationship between power reliability and the region's climatic and terrain conditions.

The Colorado Climatic Center data does not include wind data for the project area. One year of recent (1996) data, however, was obtained from the Colorado Department of Public Health and Environment (CDPHE) Air Pollution Control Division (Chick 1999a). The wind data summarized here is part of the 1996 meteorological data set collected at the Naturita Uranium Mill Tailings Project Site. The data were voluntarily submitted to CDPHE by MK-Ferguson and are considered to be representative of the majority of the project area, although the data set has not been quality assured by CDPHE. Eighty-seven percent of the time, the winds in the project area blew from a southerly direction. The predominant wind direction was south-southwest, followed closely by winds from the south. For the most part the winds rarely exceeded 10 mph. April was the windiest month, with an average wind speed of 4.9 mph. The highest wind speed that was recorded during the period (20 mph), however, occurred in October.

AIR QUALITY

The air quality for over 99 percent of the project area is good and is designated by CDPHE as in compliance with applicable state and federal standards. Although very little data exists for

the project area, CDPHE (Chick 1999b) has provided data which it believes are representative of the project area in general. ***Figures 3.2-1*** and ***3.2-2*** compare the existing pollutant levels in the project area with the National Ambient Air Quality Standards (AAQS). The existing air pollution levels are far below the allowable standards, with the exception of ozone (O_3), which is approximately 50 percent of the standard. Given the lack of pollution sources in the project area which would contribute to forming ozone, and the prevailing wind directions, the ozone levels in the project area are most likely the result of long range pollution transport from the Four Corners area and even the Los Angeles basin.

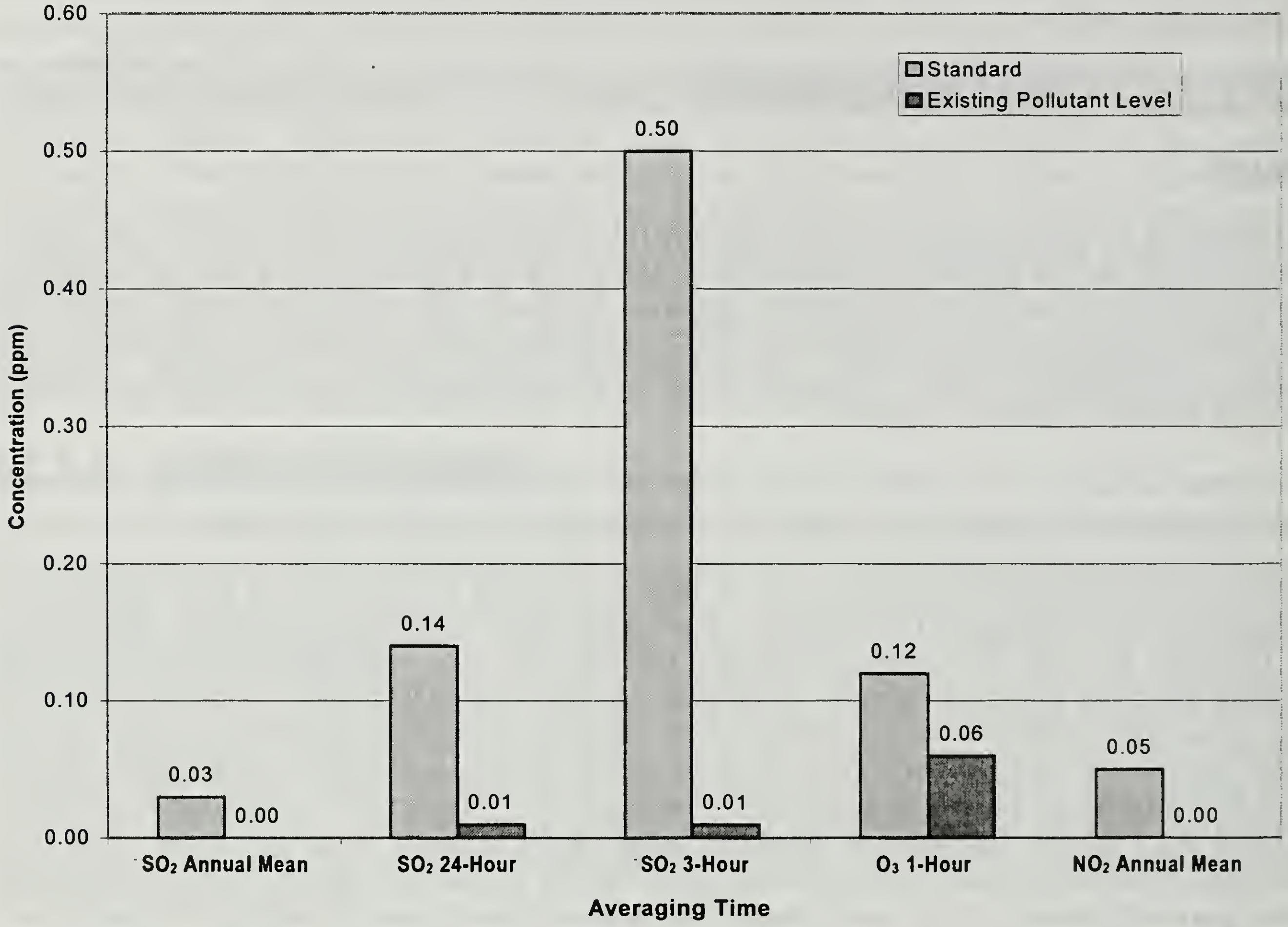

Figure 3.2-1
Comparison of Existing SO_2, O_3, and NO_2 Levels in the Project Area to National Ambient Air Quality Standards

Source: Existing pollutant data provided by Nancy Chick of CDPHE (March, 1999).
Data collected at the UMETCO – Uravan Project Site (March 1981 – February 1982).
ppm = parts per million

The air quality at the easternmost end of the project area, in the immediate vicinity of the Telluride Substation, has been classified by the State of Colorado and EPA as being in non-attainment of State and Federal particulate, PM_{10}, standards since the mid 1990's. The topography of the Telluride area sets it apart from the rest of the project area. This area is distinguished by a narrow valley floor with steep valley walls rising to high mountain peaks on either side. The physical setting makes the area subject to strong temperature inversions which trap pollutants, resulting in higher pollutant concentrations than found in the western portion of the project area. The maximum 24-hour and annual average standards for PM_{10} are 150 micrograms per cubic meter and 50 micrograms per cubic meter, respectively (CDPHE 1997). The non-attainment status is a result of the 24-hour standard for PM_{10} being exceeded in 1994. The PM_{10} sampler that recorded the violation is located at 333 West Colorado in Telluride (CDPHE 1997). This is approximately 3.7 miles east of the Telluride Substation. Both

the annual average and the maximum 24-hour concentration have declined steadily since 1994. The maximum annual concentration measured at the West Colorado site in 1997 was 25 micrograms per cubic meter, 50 percent of the standard, and 96 micrograms per cubic meter for the 24-hour concentration, 64 percent of the standard (CDPHE 1997). The status of the Telluride area for PM_{10} was updated and verified in late 2000 (McVehil-Monnett 2000); however, Telluride remains a non-attainment area for PM_{10}. The retention of this classification is based on uncertainty concerning the proposed $PM_{2.5}$ and revised PM_{10} AAQS and their subsequent legal challenge and not because of recently monitored PM_{10} data.

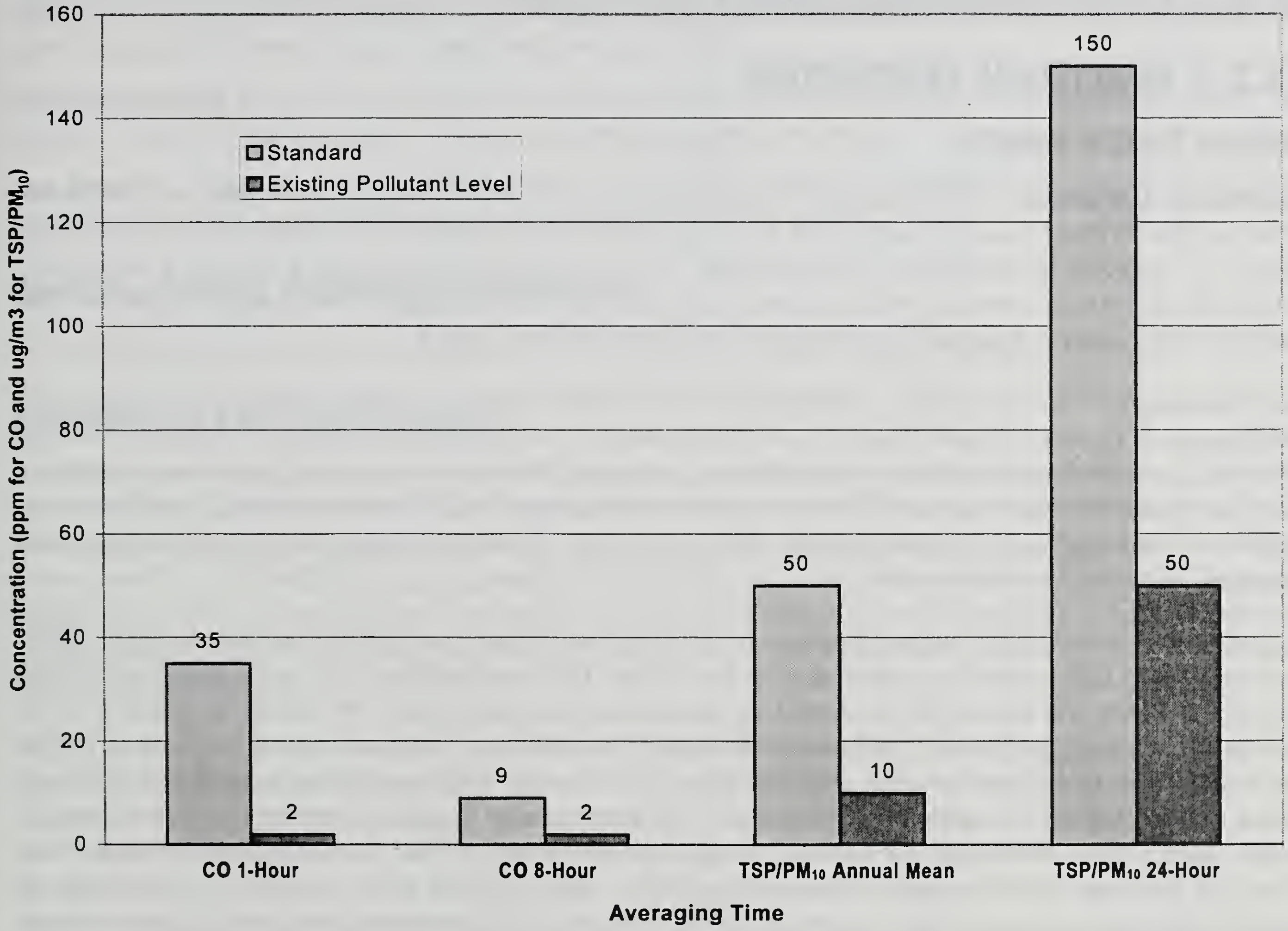

Figure 3.2-2
Comparison of Existing CO and TSP/PM_{10} Levels in the Project Area to National Ambient Air Quality Standards

Source: Existing pollutant data provided by Nancy Chick of CDPHE (March, 1999). Data collected at the UMETCO – Uravan Project Site (March 1981 – February 1982). ppm = parts per million, ug/m3 = micrograms per cubic meter.

The highest particulate concentrations occur during the winter and early spring months. Analysis of the samples indicates that the majority of the particulate matter found is re-entrained road dust (Silverstein 1999). Dust results when motor vehicles drive over sand left from winter road sanding operations and propel it up into the air. This phenomenon is particularly prevalent when snowy periods are followed by dry periods lasting long enough for the sand left on the road to dry out.

Air pollution levels will vary from location to location within the project area. This is especially true for particulate matter (TSP and PM_{10}).

There are no major sources of air pollution in the project area. A major source is defined by CDPHE (Colorado Air Regulation 3, Part A, Section I, Subsection B. 58), depending on the type of source, as a source that has annual emissions of either 250 tons per year or 100 tons per year. The majority of air emissions in the project area result from either mobile (cars or trucks) or fugitive (wind blown dust) sources. Sources of pollution in the project area include vehicle exhaust, home heating (including wood stoves and fireplaces), re-entrained road dust from leftover road sanding of paved roads, re-entrained road dust from unpaved roads, dust from farming and ranching activities, and dust resulting from wind erosion of exposed soils.

3.2.2 ENVIRONMENTAL CONSEQUENCES

3.2.2.1 ANALYTICAL FRAMEWORK

Potential Types of Impacts

Transmission Alternatives. The primary issue evaluated for the Transmission Alternatives was whether the Project would contribute to violations of air quality standards in the Telluride Area. The degree to which the alternatives would increase emissions was also evaluated. Potential effects of severe winter conditions on power outages, emergency repairs and response times are addressed in Chapter 1.0, Purpose and Need.

Potential impacts to air quality would result from the construction and operational phases of the proposed Project. Regardless of which alternative is selected the types of impacts would be similar, unless the No Action Alternative is chosen. If the No Action Alternative is chosen then air quality impacts would be minimal, resulting only from ongoing maintenance activities. Impacts would increase with time, however, as the existing system deteriorates and requires increased maintenance.

In general, construction impacts associated with the Project would be similar to any other commercial or light industry construction activities. The predominant air pollutant that would be released into the atmosphere would be particulate matter (dust). In addition, there would be lesser amounts of gaseous pollutants released into the air, such as carbon monoxide (CO), from the vehicle exhaust of the construction equipment. Due to the nature of the Project, construction impacts would be localized and of a temporary nature. The effects on air quality from construction activities are typically not detectable more than one-third mile downwind from the activity. Additionally, once construction stops for the day or work is completed at a site, the impacts on air quality end. Regardless of which alternative is selected, construction activities are expected to be completed in a few months and no permanent or residual impacts from construction-related activities are anticipated.

Operational impacts on air quality are expected to be minimal. The impacts would consist primarily of additional gaseous pollutants released into the air from the tailpipes of the few pickups used for service activities. Some fugitive dust may also result if, and when, service vehicles travel over unpaved areas.

Generation Alternatives. In addition to the types of air quality impacts that the Transmission Alternatives could cause, the Generation Alternatives would entail the construction and operation of a new distributed generation facility near Telluride and a natural gas compressor station near Redvale. Construction-related effects for the generation facilities would be similar to those described above for the Transmission Alternatives. The operation of a generation facility near Telluride and a gas compressor station near Redvale would result in air pollutant emissions, including oxides of nitrogen (NOx), particulates (PM_{10}), sulfates (SOx), carbon monoxide (CO) and hydrocarbons (HC). The gas turbine emissions would be directly related to the number of annual operating hours. Differences in air emissions are described in this section of the EIS by Generation Alternative.

Other air quality-related effects are the degree to which the generation emissions could affect the visibility conditions at Class I and II Wilderness Areas. Visibility impacts to wilderness areas are evaluated according to whether the Generation Alternatives could exceed established criteria for plume perceptibility and contrast.

Definition of Impact Levels

Potential impacts to air quality were assessed according to the following criteria:

High Impacts would occur if an alternative would cause or contribute to a violation of an air quality standard. High impacts would also occur if the alternative would result in impaired visibility conditions at Class I or II wilderness areas.

Moderate Impacts would occur if an alternative results in short-term increases in ambient air quality levels in residential or other potentially sensitive areas.

Low Impacts would occur if an alternative results in short-term increases in ambient air quality levels in areas with no residences or other sensitive receptors.

Applicable Permits, Standards and Ordinances

Standards applicable to this Project are the National Ambient Air Quality Standards.

Environmental Protection Measures

Tri-State has committed to a number of Environmental Protection Measures that would reduce potential air quality effects of the Transmission Alternatives. These are shown in *Table 2.2-4* (see Chapter 2) and include numbers 5, 6, 7, 12, 13, 14, and 15. The Environmental Protection Measures for air quality focus primarily on minimizing dust and tailpipe emissions. Tailpipe emissions would be minimized by maintaining all vehicles to manufacturers' specifications. Additionally, vehicle idle and warm up times would be minimized and vehicles not in use would be shut off.

Fugitive dust from construction activities could be minimized by following good construction practices. Exposed and disturbed areas could be kept to a minimum. Areas that must be exposed would not be disturbed prematurely and would be revegetated as soon as work activities were completed in that area. Drop heights would be kept to a minimum when handling or transferring soils or aggregate. All loads would be covered. Because the majority of dust would be generated by vehicles traveling on paved or unpaved roads, speed limits would be set and enforced. Unpaved roads and activity areas should be kept wet, and paved roadways cleaned on a continuing basis in areas where there is a transition from unpaved to paved surfaces. Particular attention should be paid to the period immediately following precipitation events when mud and dirt, which can be tracked onto paved roads from unpaved roads and surfaces, begins to dry. Areas where mud and dirt have been tracked onto public roadways represent a potentially major source of dust.

No additional Environmental Protection Measures are identified for the distributed Generation Alternatives since this type of alternative is not being proposed by Tri-State. EPMs applicable to the DG Alternatives' transmission line upgrades would be the same as disclosed in the EIS for the transmission alternative, however. Should a Generation Alternative be proposed by another energy developer in the future, additional protection measures would be developed by the proponent and Federal and State regulatory agencies.

3.2.2.2 IMPACTS OF THE PRIMARY TRANSMISSION ALTERNATIVES

Air quality impact modeling studies for the primary Transmission Alternatives were not performed. The magnitude and the duration of the potential short-term construction-related

impacts simply do not warrant this level of effort, nor was sufficient information available regarding the proposed construction schedule. However, a semi-quantitative assessment of the impacts was conducted for purposes of comparing the Transmission Alternatives and the magnitude of impacts that could result.

The construction and schedule information available at the time of this analysis was used to estimate both particulate and tailpipe emissions resulting from each of the alternatives. In addition to CO, the tailpipe emissions include hydrocarbons (HC) and nitrogen dioxide (NO_2). As stated earlier, the majority of the impacts from any of the alternatives would result from re-entrainment of road and surface dust from the passage of vehicles as well as from the vehicles' exhausts. The project construction information contained in Appendix A-1 was used with EPA emission factors to estimate emissions resulting from the primary alternatives. The emission factors used in this analysis can be found in EPA's Compilation of Air Pollution Emission Factors AP-42, Volume I: Stationary Point and Area Sources (EPA 1999) and Compilation of Air Pollution Emission Factors AP-42, Volume II: Mobile Sources (EPA 1998).

Emission estimates were made for both construction and operational phases of the primary alternatives. The emission estimates are summarized and compared to each other in ***Figures 3.2-3, 3.2-4,*** and ***3.2-5***. The emissions summarized in these figures represent the sum of the emissions estimates for all the activities that make up each alternative. In the case of the construction emissions, the numbers presented represent an estimate of the total emissions resulting from construction of the alternative. The estimates for operating emissions are estimates of annual emissions and as such would be ongoing throughout the life of the alternative.

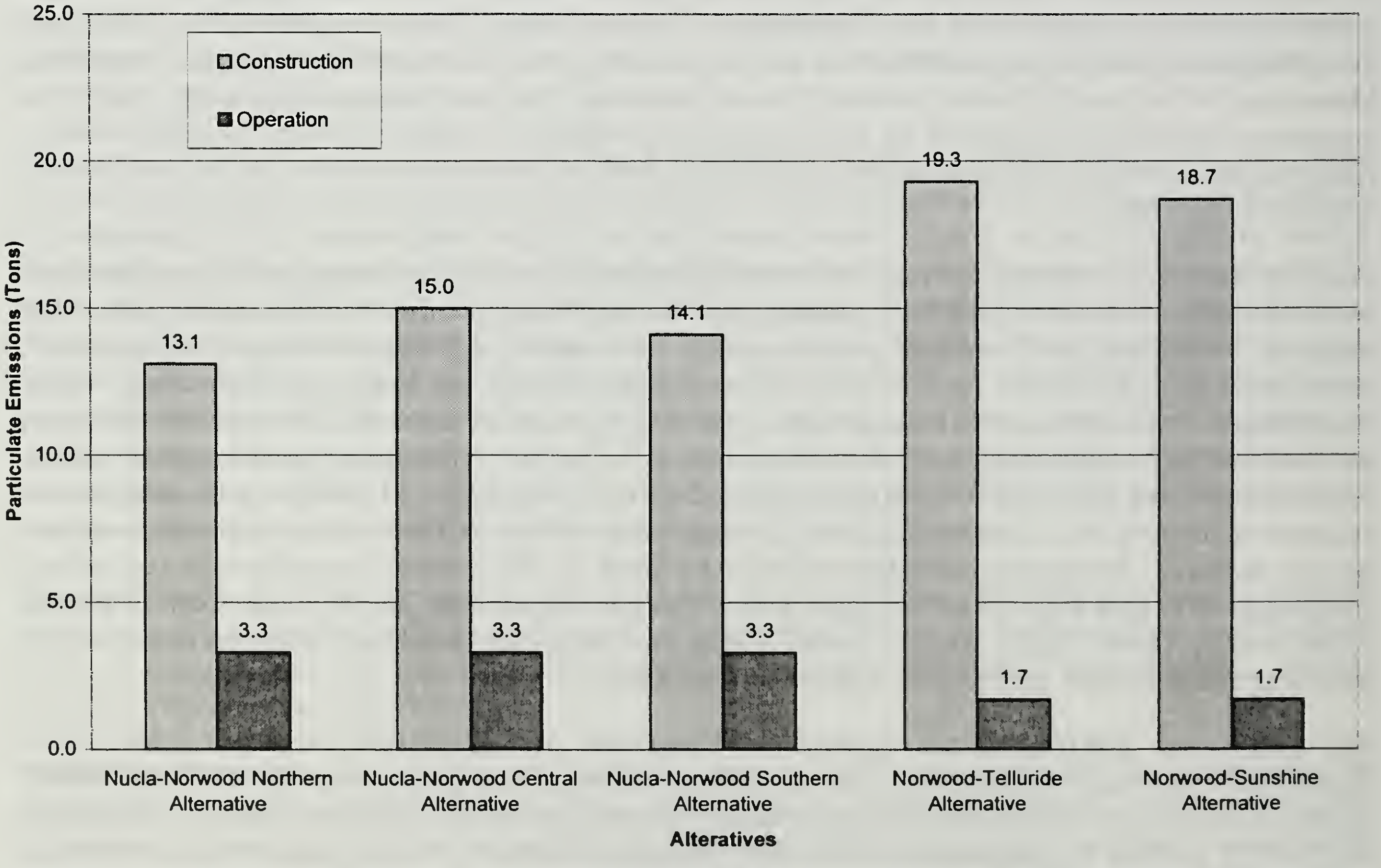

Figure 3.2-3
Comparison of Particulate Emissions Estimated to Result from Construction and Operation of Alternatives

Source: Emission levels presented are estimates based on preliminary engineering information. Actual emissions may vary. This information prepared to show the difference between alternatives.

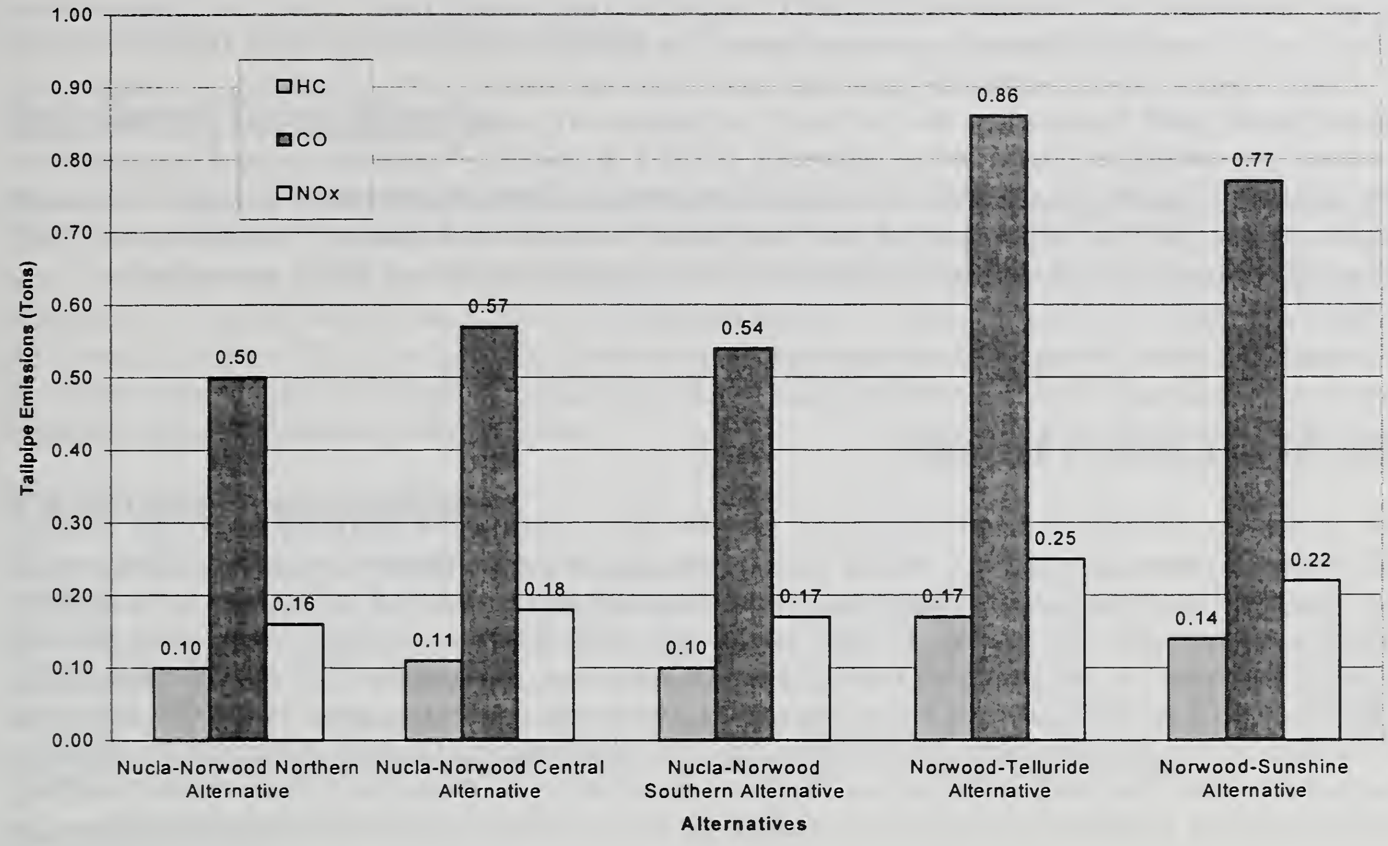

Figure 3.2-4
Comparison of Tailpipe Emissions Estimated to Result from *Construction* of Alternatives

Source: Emission levels are estimates based on preliminary engineering information. Actual emissions may vary. This information prepared to show the difference between alternatives.

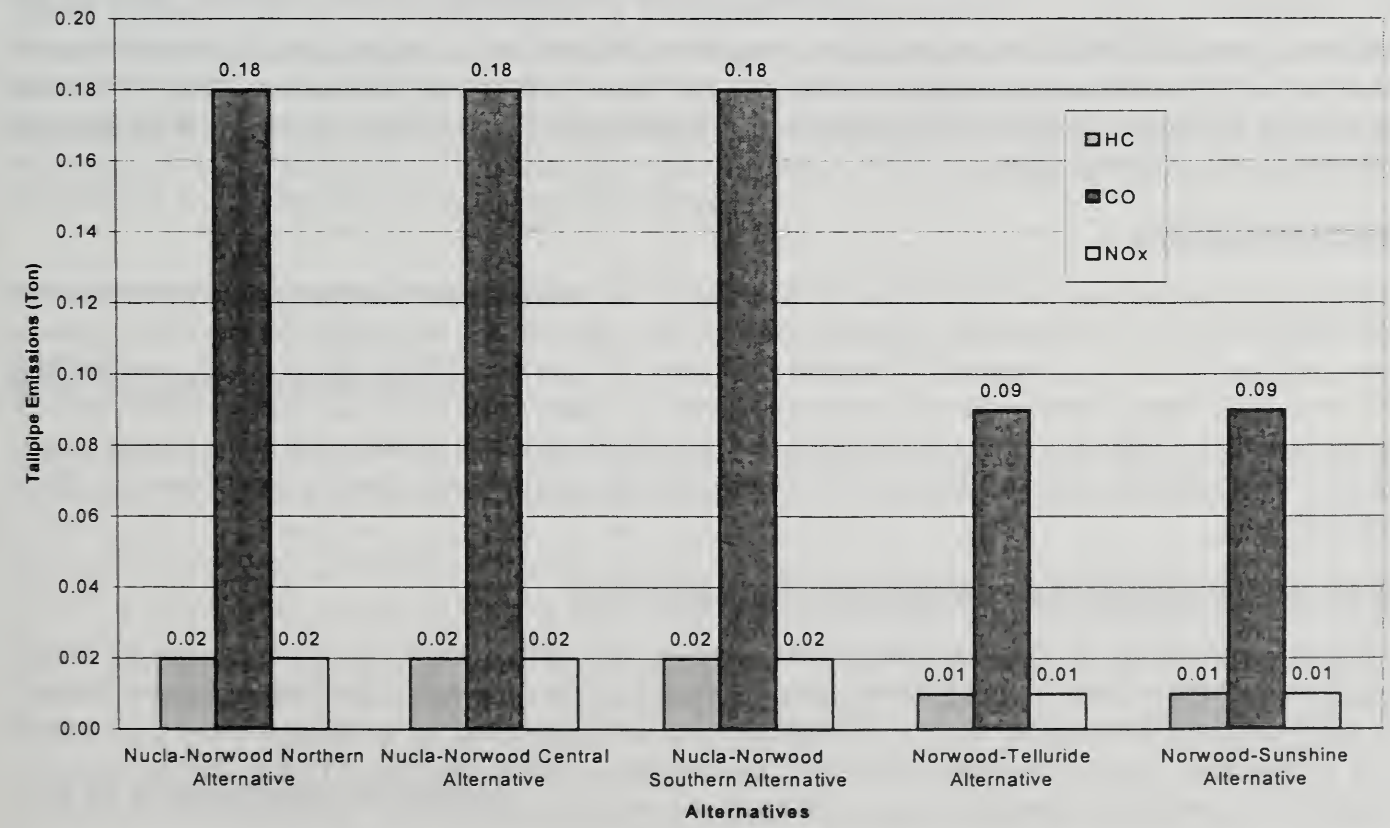

Figure 3.2-5
Comparison of Tailpipe Emissions Estimated to Result from *Operation* of Alternatives

Source: Emission levels are estimates based on preliminary engineering information. Actual emissions may vary. This information prepared to show the difference between alternatives.

Actual emissions, and therefore air quality impacts, that would result from the alternatives would vary from the estimates presented here. The variance would result from the differences in actual construction activities and the assumptions made here. However, because the assumptions used to develop the emission estimates are consistent from one alternative to another, the estimates presented in *Figures* 3.2-3, 3.2-4, and 3.2-5 provide a good comparative analysis showing which alternative would have more and which alternative would have less impact on air quality. Regardless of which alternative is selected, the implementation of that alternative would not cause or contribute to an air quality standard being exceeded.

Nucla-Norwood Northern Alternative

The emission estimates summarized in *Figures* 3.2-3 and 3.2-4 indicate that the Nucla-Norwood Northern Alternative would have lower construction-related emissions than any of the other alternatives. Construction-related emissions are estimated to be 13.1 tons of dust (particulate matter), 0.1 ton of HC, 0.5 ton of CO, and 0.16 ton of NO_2. Annual operating emissions are estimated to be 3.3 tons of particulates and, from *Figure* 3.2-5, 0.02 ton of HC, 0.18 ton of CO, and 0.02 ton of NO_2. Operating emissions are anticipated to be the same for the Nucla-Norwood Northern Alternative, the Nucla-Norwood Central Alternative, and the Nucla-Norwood Southern Alternative. They are expected to be twice as high as those resulting from operation of either the Norwood-Telluride or the Norwood-Sunshine Alternative.

115 kV Transmission Line Effects

Construction emissions for the 115 kV line are estimated to be 9.8 tons of dust, 0.07 ton of HC, 0.38 ton of CO, and 0.11 ton of NO_2. Emissions are not anticipated to result from operating the line. Impacts of fugitive dust and other emissions are anticipated to be low overall. Some moderate level of effect may occur when project activities are taking place near residences or other sensitive areas, depending on whether the wind is blowing toward or away from the residences or sensitive areas. The potential for moderate effects would be more likely during construction than operation.

Substation Effects

Construction emissions for the Norwood Substation expansion and the Nucla modification are estimated to be 3.3 tons of dust, 0.03 ton of HC, 0.12 ton of CO, and 0.05 ton of NO_2. Annual operating emissions are expected to include 1.7 tons of dust and 0.01, 0.09, and 0.01 tons of HC, CO, and NO_2, respectively. Some moderate level of effect may occur at nearby residences if project activities take place when the wind is blowing toward the residences, or sensitive areas. Again, the potential for moderate effects would be more likely during construction than operation.

69 kV Transmission Line and Distribution System Effects

Construction emissions for the distribution system are estimated to be 0.1 ton of dust, 0.001 ton of HC, 0.003 ton of CO, and 0.001 ton of NO_2. Emissions are not expected from operations. Overall, impacts associated with distribution system modifications would be very low. Since this alternative would entail rebuilding the existing 69 kV line to 115 kV in its existing location, no additional impacts beyond those reported for the 115 kV system would occur.

Nucla-Norwood Central Alternative

Emission estimates for the Nucla-Norwood Central Alternative are summarized in *Figures 3.2-3, 3.2-4,* and *3.2-5*. Construction-related emissions are estimated to be 15.0 tons of dust (particulate matter), 0.11 ton of HC, 0.57 ton of CO, and 0.18 ton of NO_2. Annual operating emissions are estimated to be 3.3 tons of particulates and, from *Figure 3.2-5*, 0.02 ton of HC, 0.18 ton of CO, and 0.02 ton of NO_2. Operating emissions are anticipated to be the same for the Nucla-Norwood Northern Alternative, the Nucla-Norwood Central Alternative, and the Nucla-Norwood Southern Alternative.

115 kV Transmission Line Effects

Construction emissions for the 115 kV line are estimated to be 11.6 tons of dust, 0.08 ton of HC, 0.45 ton of CO, and 0.13 ton of NO_2. Emissions are not anticipated to result from operating the line. Potential short-term impacts associated with improving existing access and/or building spur roads along the route, as well as other construction activities, are anticipated to result in impacts ranging from low to moderate. The level of impact would depend on the juxtaposition of project activities, the location of residences or other sensitive areas, and wind direction.

Substation Effects

Air quality impacts of expanding the Norwood Substation at Site A and modifying the Nucla Substation would be the same as reported for the Nucla-Norwood Northern Alternative.

69 kV Transmission Line and Distribution System Effects

Construction emissions for the distribution system are estimated to be 0.1 ton of dust, 0.001 ton of HC, 0.003 ton of CO, and 0.001 ton of NO_2. Emissions are not expected from operations. Impacts of removing approximately 11.7 miles of the existing 69 kV line would be similar as reported for the Nucla-Norwood Northern Alternative. Overall, impacts of this alternative on air quality would be low to moderate in degree.

Nucla-Norwood Southern Alternative

Emission estimates for the Nucla-Norwood Southern Alternative are summarized in *Figures 3.2-3, 3.2-4,* and *3.2-5*. Construction-related emissions are estimated to be 14.1 tons of dust (particulate matter), 0.10 ton of HC, 0.54 ton of CO, and 0.17 ton of NO_2. Annual operating emissions are estimated to be 3.3 tons of particulates and, from *Figure 3.2-5*, 0.02 ton of HC, 0.18 ton of CO, and 0.02 ton of NO_2. Operating emissions are anticipated to be the same for the Nucla-Norwood Northern Alternative, the Nucla-Norwood Central Alternative, and the Nucla-Norwood Southern Alternative. They are expected to be twice as much as those resulting from operation of either the Norwood-Telluride or the Norwood-Sunshine Alternatives.

115 kV Transmission Line Effects

Construction emissions for the 115 kV line are estimated to be 10.8 tons of dust, 0.07 ton of HC, 0.42 ton of CO, and 0.12 ton of NO_2. Emissions are not anticipated to result from operating the line. Potential short-term impacts associated with improving existing access and/or building spur roads along the route, as well as other construction activities, are anticipated to result in

impacts ranging from low to moderate. The level of impact would depend on the juxtaposition of project activities, the location of residences or other sensitive areas, and wind direction.

Substation Effects

The impacts of expanding the Norwood Substation and modifying the Nucla Substation would be the same as previously reported for the Nucla-Norwood Northern Alternative.

69 kV Transmission Line and Distribution System Effects

Construction emissions for the distribution system are estimated to be 0.1 ton of dust, 0.001 ton of HC, 0.003 ton of CO, and 0.001 ton of NO_2. Emissions are not expected from operations. Impacts of removing approximately 16.3 miles of the existing 69 kV line would be similar as reported for the Nucla-Norwood Northern Alternative. Overall, impacts of this alternative on air quality would be low to moderate in degree.

Norwood-Sunshine Alternative

Emission estimates for the Norwood-Sunshine Alternative are summarized in ***Figures*** ***3.2-3***, ***3.2-4***, and ***3.2-5***. Construction-related emissions are estimated to be 19.6 tons of dust (particulate matter), 0.14 ton of HC, 0.77 ton of CO, and 0.22 ton of NO_2. Annual operating emissions are estimated to be 1.7 tons of particulates and, from ***Figure 3.2-5***, 0.01 ton of HC, 0.09 ton of CO, and 0.01 ton of NO_2.

115 kV Transmission Line Effects

Construction emissions for the 115 kV line are estimated to be 16.7 tons of dust, 0.12 ton of HC, 0.65 ton of CO, and 0.18 ton of NO_2. Emissions are not anticipated to result from operating the line. Potential short-term impacts associated with improving existing access and/or building spur roads along the route, as well as other construction activities, are anticipated to range from low to moderate. The level of impact would depend on the juxtaposition of project activities, the location of residences or other sensitive areas, and wind direction.

Substation Effects

Construction emissions for the Sunshine Substation are estimated to be 1.3 tons of dust, 0.01 ton of HC, 0.05 ton of CO, and 0.02 ton of NO_2. Annual operating emissions are expected to include 1.7 tons of dust and 0.01, 0.09, and 0.01 tons of HC, CO, and NO_2, respectively. Impacts associated with dismantling the Oak Hill Substation and making minor modifications to the Specie Mesa and Wilson Mesa Substations would be similar to the Sunshine Substation effects. Overall, impacts associated with the substation modifications would be low to moderate, depending on whether or not winds were blowing toward residences or other sensitive receptors when construction activities were occurring.

69 kV Transmission Line and Distribution System Effects

Construction emissions for the overhead and underground distribution system are estimated to be 1.6 tons of dust, 0.01 ton of HC, 0.07 ton of CO, and 0.02 ton of NO_2. Emissions are not expected from operations. Overall, construction impacts for the distribution system changes are estimated to be low. Since this alternative would entail rebuilding the 69 kV line as a 115 kV system in the same location, no additional impacts, beyond those reported for the 115 kV line would result.

Norwood-Telluride Alternative

The emission estimates summarized in ***Figures 3.2-3*** and ***3.2-4*** indicate that the Norwood-Telluride Alternative would have higher construction-related emissions than any of the other alternatives. Construction-related emissions are estimated to be 21.9 tons of dust (particulate matter), 0.17 ton of HC, 0.86 ton of CO, and 0.25 ton of NO_2. Annual operating emissions are estimated to be 1.7 tons of particulates and, from ***Figure 3.2-5***, 0.01 ton of HC, 0.09 ton of CO, and 0.01 ton of NO_2. Although the Telluride Substation and the easternmost end of the transmission line are located in the Telluride PM_{10} non-attainment area, implementation of this alternative would not cause or contribute to the non-attainment designation. PM_{10} levels in the area have been below the standard since 1995 and the trend through 1997 has been for them to decrease. In addition, the greatest potential for emissions to occur with any of the alternatives is during construction, and construction would take place during the opposite time of the year from when the highest particulate levels have been observed. Construction would take place during the summer months and the highest particulate levels occur during the winter months.

115 kV Transmission Line Effects

Construction emissions for the 115 kV line are estimated to be 17.3 tons of dust, 0.12 ton of HC, 0.67 ton of CO, and 0.19 ton of NO_2. Emissions are not anticipated to result from operating the line. Potential short-term impacts associated with improving existing access and/or building spur roads along the route, as well as other construction activities, are anticipated to result in impacts ranging from low to moderate. The level of impact would depend on the juxtaposition of project activities, the location of residences or other sensitive areas, and wind direction.

Substation Effects

Construction emissions for the Telluride Substation are estimated to be 1.0 ton of dust, 0.01 ton of HC, 0.04 ton of CO, and 0.02 ton of NO_2. Annual operating emissions are expected to include 1.7 tons of dust and 0.01, 0.09, and 0.01 tons of HC, CO, and NO_2, respectively. Some moderate level of effect may occur at nearby sensitive areas (*e.g.* Galloping Goose Trail) if project activities take place when the wind is blowing toward such areas. Again, the potential for moderate effects would be more likely during construction than operation. Impacts of dismantling the Oak Hill Substation and making minor modifications to the Specie Mesa Substation would be low. Overall, impacts associated with the substation modifications would be low to moderate, depending on whether winds were blowing toward residences or other sensitive receptors when construction activities were occurring.

69 kV Transmission Line and Distribution System Effects

Construction emissions for the overhead and underground distribution system are estimated to be 3.6 tons of dust, 0.03 ton of HC, 0.15 ton of CO, and 0.04 ton of NO_2. Emissions are not expected from operations. Construction emissions for the removal of the 69 kV line for approximately 10.4 miles would be similar as reported for the other alternatives. Overall, impacts of this alternative on air quality would be low to moderate in degree.

3.2.2.3 IMPACTS OF THE SUBALTERNATIVES

115 kV Transmission Line Subalternatives – A, B, C, D, E and Underground

The Overhead Subalternatives A, B, C, D, and E would not have quantifiable differences in air quality impacts from the primary alternatives. The primary effect the subalternatives would have on air quality would be to change the area where the impacts would occur.

In comparison to the Overhead Subalternatives, the Underground Subalternative would result in greater amounts of soil excavation for the trench along the length of the right-of-way. Short-term increases in fugitive dust would most likely result, but are not considered significant with implementation of the EPMs.

Norwood Substation Alternative Site B

Development of a new Norwood Substation at Site B would not result in quantifiable differences in air quality impacts from the proposed expansion of the existing Norwood Substation (Site A).

3.2.2.4 CUMULATIVE EFFECTS

The proposed Project could be constructed concurrent with several reasonable and foreseeable projects including the San Miguel Hydroelectric Project and CDOT's planned improvements to the Highway 145/South Fork Road Interchange. In addition, ongoing development in the Telluride Area would also contribute to cumulative air quality impacts that result from construction activities and soil disturbances. Overall, the impacts are expected to be low to moderate, and not cause or contribute to the non-attainment status of the Telluride area. As stated above, there have been no exceedences of the PM_{10} standard in Telluride since 1994. The nature of the foreseeable projects means that the majority of air emissions would result from construction activities and be temporary and transient. Additionally, these activities would primarily take place during the warm weather months and so would not actually be cumulative with the higher particulate concentrations that occur during the winter months.

3.2.2.5 POTENTIAL MITIGATION MEASURES

Due to the short duration of impact and the Environmental Protection Measures that would be implemented for the Project, no additional mitigation measures are suggested for further reducing air quality emissions for the Transmission Alternatives. All air quality impacts from the Transmission Alternatives would be low to moderate in severity.

3.2.2.6 IMPACTS OF THE GENERATION ALTERNATIVES

The Generation Alternatives would result in long-term air emissions during the operation of the distributed generator near Telluride and the gas compressor station near Redvale. Impact issues related to the generator and compressor emissions include:

- Whether the alternatives would be in compliance with the National Air Quality Standards
- Whether the generator emissions could result in reduced or impaired visibility conditions at Class I and II Wilderness Areas

In order to evaluate these issues, estimates of air pollutant emissions were developed by AESC for each of the Generation Alternatives, as part of the feasibility study conducted for the Forest Service in 2000 (AESC 2000). Air emissions from the generator and compressor facilities would vary by generator alternative and are directly related to the annual hours of operation.

McVehil-Monnett Associates, Inc. was also retained to evaluate and model the generation alternative emissions for purposes of determining whether established criteria for impairing visibility conditions at the wilderness areas would be violated. These studies are based upon the best available meteorological data for the project area and EPA's Workbook for Plume Visual Impact Screening and Analysis (EPA-454/R-92-021). In accordance with this EPA methodology, VISCREEN visibility impact analyses were performed for each of the three distributed generation scenarios. The results of these studies are summarized below.

In addition to the generation alternative emission issues noted above, these alternatives would still require various modifications to Tri-State and SMPA's transmission, distribution and substation facilities. The impacts from these facilities would be short-term construction-related and the same as previously reported for the Transmission Alternatives.

Air Emission Impacts of Alternative Generator and Compressor Station Scenarios

Large Generator Alternative – The gas turbine emissions by pollutant are shown *in Figure 3.2-6* for the Large Generator scenario. The annual gas turbine emissions would be directly proportional to the number of annual operation hours. Under this scenario, it was assumed that the generator would initially operate 364 hours in the year 2002, and escalate to 1,688 hours by 2020. The distributed generator would displace air emissions produced by central power plants. However, the generator would produce air emissions in the local Telluride area, essentially importing some of the displaced central power plant emissions. National Air Quality Standards would not be violated, however, by this alternative.

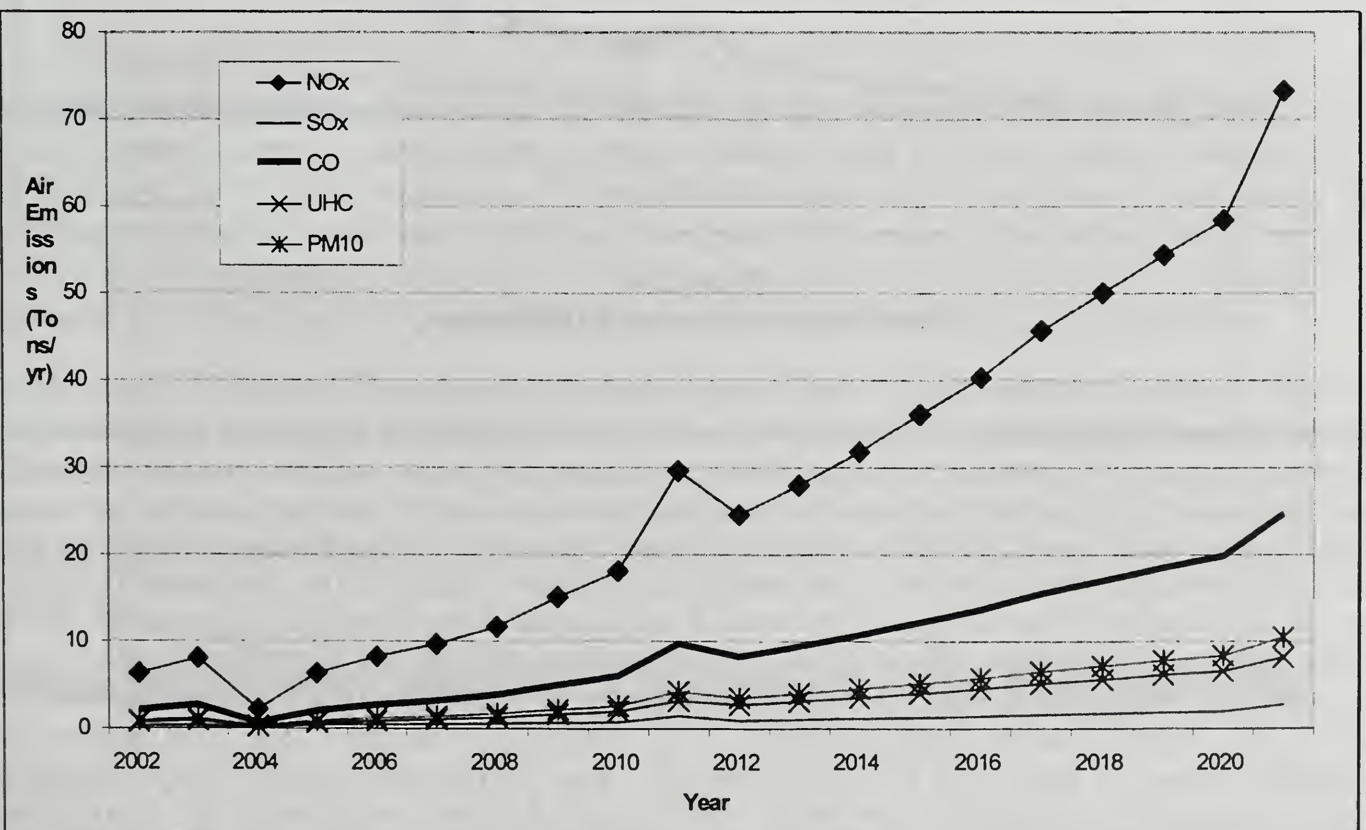

Figure 3.2-6
Large Generator Scenario Air Emissions

Small Generator Alternative - The gas turbine emissions by pollutant are shown in *Figure 3.2-7* for the Small Generator scenario. The annual gas turbine emissions would be directly proportional to the number of annual operation hours. Under this scenario, it was also assumed that the

generator would initially operate 364 hours in the year 2002, and escalate to 1688 hours by 2020. Compared to the Large Generator Alternative, air pollutant emissions are less, since this alternative assumes that the 13MW of power from the Nucla-Sunshine 44/69kV line would continue to be available. The distributed generator would displace air emissions produced by central power plants. However, the generator would produce air emissions in the local Telluride area, essentially importing some of the displaced central power plant emissions. National Air Quality Standards would not be violated, however, by this alternative.

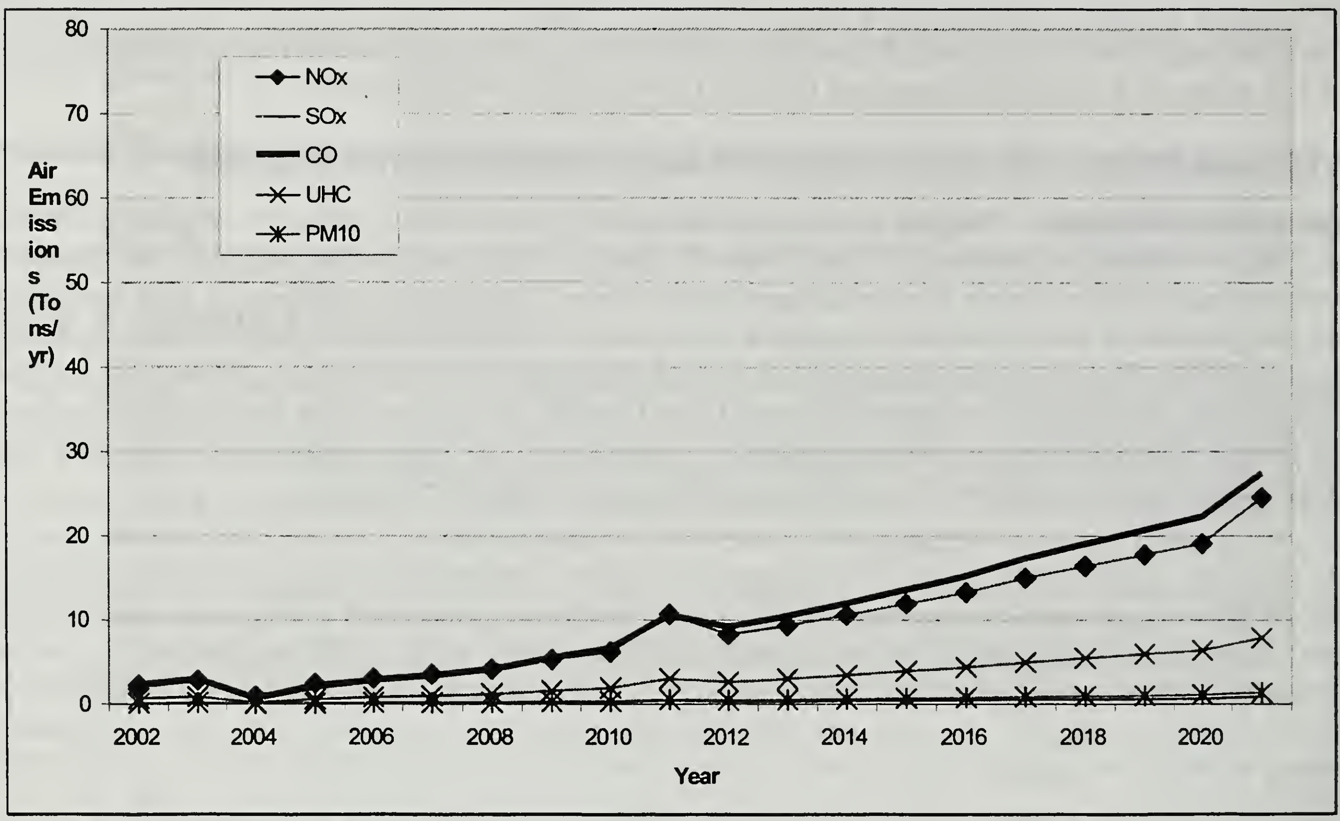

Figure 3.2-7
Small Generator Scenario Air Emissions

Emergency Generator Alternative - The gas turbine emissions by pollutant are shown in *Figure 3.2-8* for the Emergency Generator scenario. The annual gas turbine emissions would be directly proportional to the number of annual operation hours. Under this scenario, it was assumed that the generator would typically operate 48 hours per year for maintenance startups and annual operations. During years when emergency outages occur on the Hesperus-Telluride line, it was assumed that the generator would operate 248 hours per year. Compared to the Large and Small Generator Alternatives, air pollutant emissions are significantly less, since this alternative assumes that the generator would only be operational for routine maintenance and in the event of an emergency outage of the Hesperus-Telluride Line. The increase in emissions shown in *Figure 3.2-8* for the years 2011 and 2021 are the result of the emergency hours of operation simulated for those years. During these conditions, the distributed generator would displace air emissions produced by central power plants. National Air Quality Standards would not be violated by this alternative.

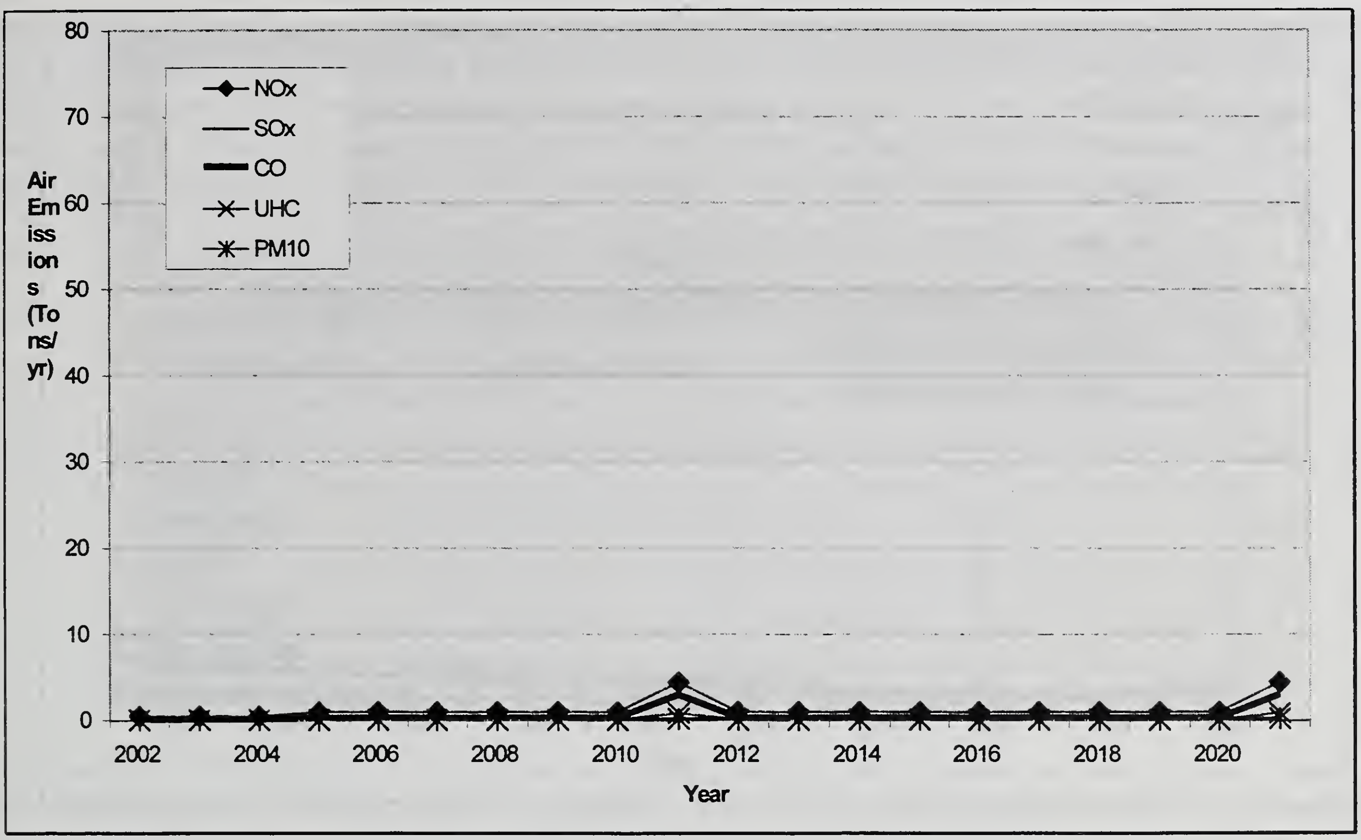

Figure 3.2-8
Emergency Generator Scenario Air Emissions

Gas Compressor Air Emissions – In addition to the emissions reported above for the Large and Small Generator scenarios, these two alternatives would also result in air pollutant emissions from the Redvale Gas Compressor Station. ***Figure 3.2-9*** illustrates the compressor emissions by air pollutant. Air pollutant impacts from the Emergency Generator Alternative would be very low, since the compressor would only be operated in the event of an outage on the Hesperus-Telluride line. National Air Quality Standards would not be violated by this facility.

In summary, all three of the generator scenarios would result in air emission impacts. Impacts from the Large and Small Generator scenarios are considered long-term and impacts would be directly related to the hours of operation. Impacts from the Emergency Generator scenario would be substantially less, due to the operation of this facility only during an emergency outage. ***Figure 3.2-10*** compares the NOx emissions growth for all three distributed generator scenarios.

Potential Visibility Impacts of Generation Alternatives on Class I and II Wilderness Areas

The visibility impact analysis consisted of using the EPA-approved VISCREEN model in a two-tiered approach (i.e., screening and refined modes) to determine if the Generation Alternatives would likely result in visibility impacts as measured by established plume perceptibility and contrast criteria. This analysis focused on determining the potential for impaired visibility impacts at Class I and II Wilderness Areas that are within 100 km of the Telluride Substation (see *Table 3.2-1*).

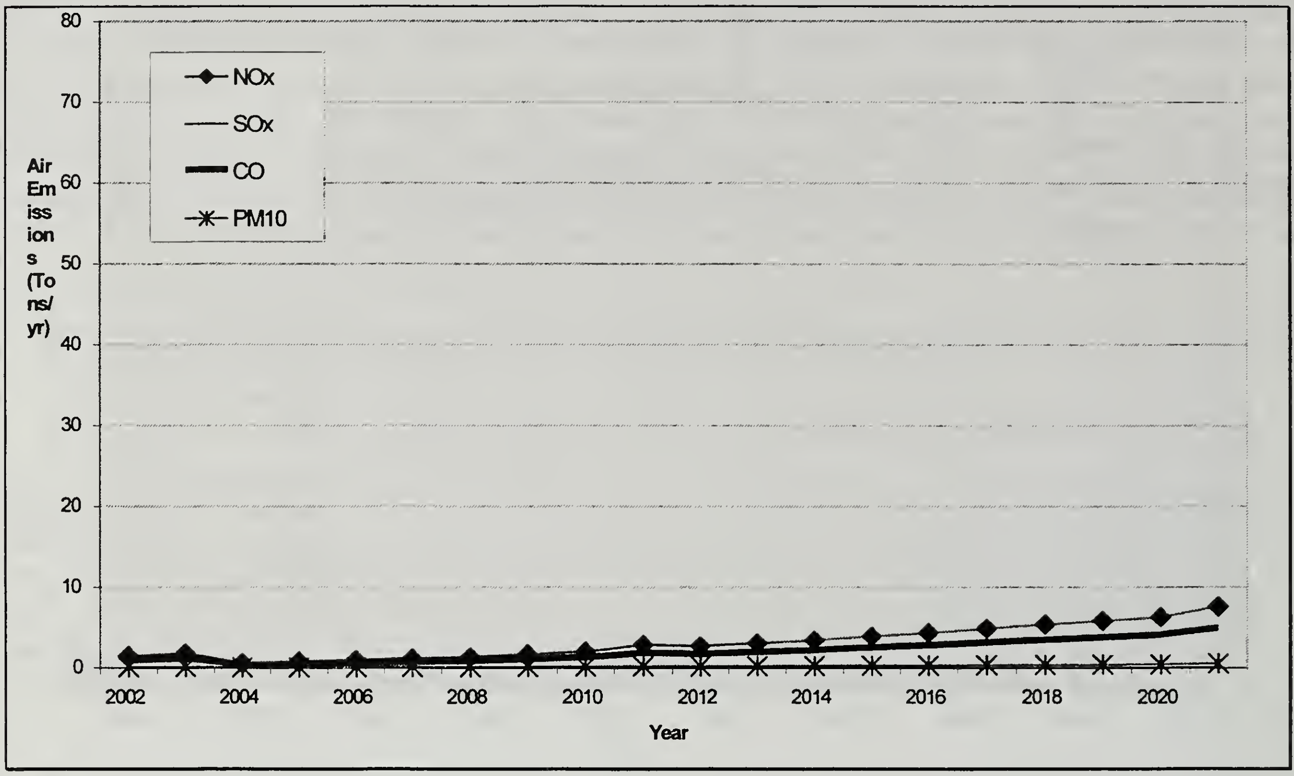

Figure 3.2-9
Estimated Small & Large Generator Scenarios Air Emissions from Redvale Compressor

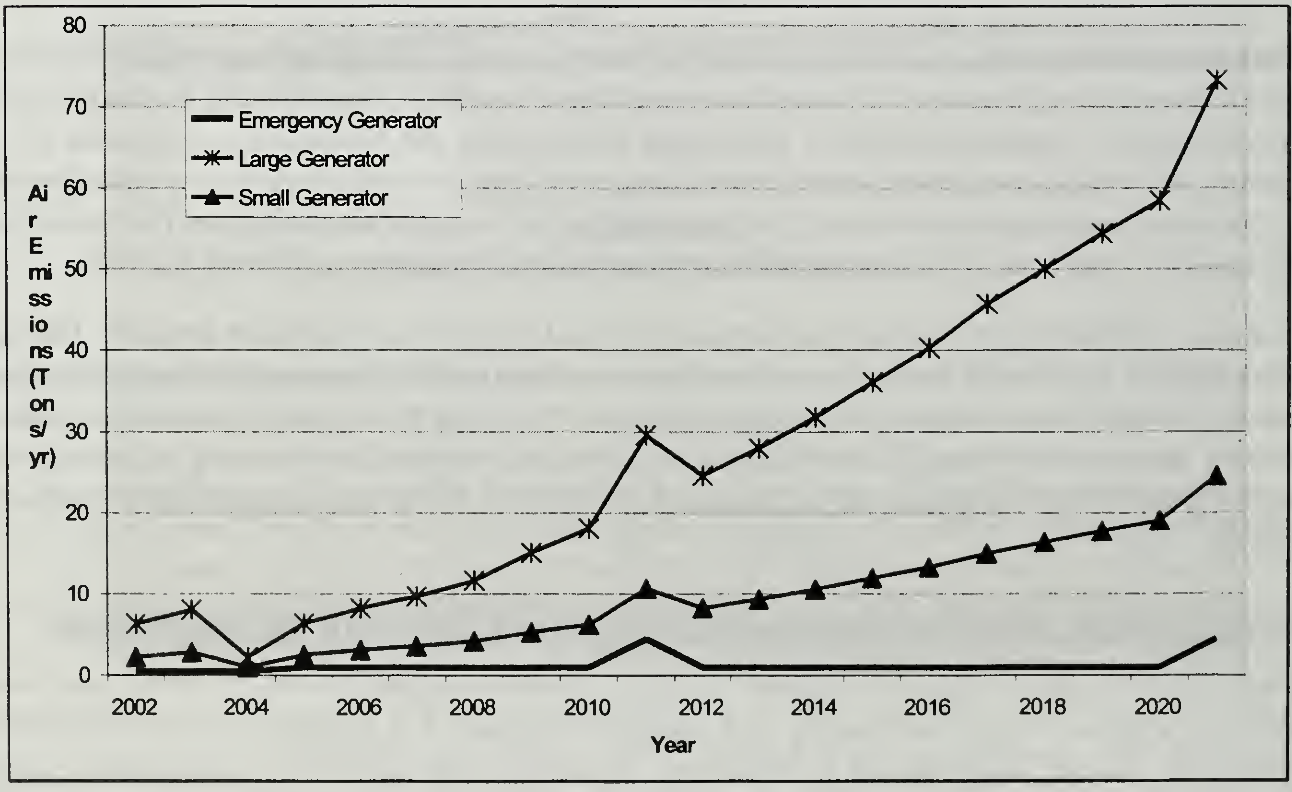

Figure 3.2-10
NOx Emissions of the Distributed Generator Scenarios

The VISCREEN model estimates visibility impacts at a variety of observer locations against sky and terrain backgrounds and at various sun angles (i.e. various times of the day with the

observer facing the sun and looking in the opposite direction from the sun). Visibility impacts are quantified by two different parameters - plume perceptibility (ΔE) and plume contrast (Cp). Maximum visibility impacts are deemed as being insignificantly perceptible if they are below both a ΔE of 2.00 and a Cp of ±0.050. VISCREEN estimates visibility impacts based on short-term (hourly) emission rates of particulates and oxides of nitrogen (NOx).

Table 3.2-1
Summary of Wilderness Areas Studied by Class and Distance

Wilderness Area	Designated Class	Distance from Telluride to Wilderness Area (km.)
West Elk	I	82
La Garita	I	53
Weminuche	I	24
Big Blue	II	22
Lizard Head	II	15
Mt. Sneffels	II	5
Black Canyon/Gunnison	I	70

Two levels of VISCREEN modeling were conducted for the Generation Alternatives. Level I is a screening level of analysis that is intended to indicate when additional studies are needed to determine the potential for impacts. Visibility impacts are based on Gaussian dispersion of the modeled emissions that are assumed to be instantaneously transported to the impact area being evaluated. Level I analyses do not consider whether wind flow of a specified speed and atmospheric stability is actually in the direction of the impact area. Level II addresses this limitation by considering site-specific meteorology and using meteorological conditions for only those wind directions transporting source emissions to the impact area. Additional information regarding the VISCREEN model and analyses is provided in the McVehil-Monnett Associates technical report entitled "Visibility Impact Analyses from Distributed Generation Alternative Emissions Report" (January 2001). Copies of this technical report are available for review at the Norwood District Ranger Station in Norwood, Colorado. The study findings for each of the Generation Alternatives are contained herein. *Table* 3.2-2 summarizes the VISCREEN Level II results.

Table 3.2-2
Summary of VISCREEN Level II Analyses of Distributed Generation Alternatives

Wilderness Area Evaluated	Large Generator Alternative	Small Generator Alternative	Emergency Generator Alternative
West Elk (Class I)	Passes both ΔE and Cp	Passes both ΔE and Cp	Passes both ΔE and Cp
La Garita (Class I)	Fails ΔE, Passes Cp	Passes both ΔE and Cp	Passes both ΔE and Cp
Weminuche (Class I)	Fails ΔE, Passes Cp	Passes both ΔE and Cp	Passes both ΔE and Cp
Black Canyon/Gunnison (Class I)	Passes both ΔE and Cp	Passes both ΔE and Cp	Passes both ΔE and Cp
Mt. Sneffels (Class II)	Fails both ΔE and Cp	Fails both ΔE and Cp	Fails both ΔE and Cp
Lizard Head (Class II)	Fails both ΔE and Cp	Fails ΔE, Passes Cp	Fails ΔE, Passes Cp
Big Blue (Class II)	Fails both ΔE and Cp	Fails ΔE, Passes Cp	Fails ΔE, Passes Cp
Source: McVehil-Monnett Associates, Inc. 2001			

Large Generator Alternative - *Table* 3.2-2 shows the Level II VISCREEN modeling for the Large Generator Alternative. The modeling analyses documents that this generation scenario has the potential for causing impaired visibility impacts at all the wilderness areas within 100 km, except the West Elk Wilderness, that is located 82 km away.

Small Generator Alternative – For the Small Generator Alternative scenario, two small Solar Titan 130 generators were assumed. *Table* 3.2-2 shows the results of the Level II VISCREEN analyses for the Small Generator Alternative. The modeling analyses indicates that this Generation Alternative would have the potential for impairing the visibility at the Mt. Sneffels, Lizard Head and Big Blue Class II Wilderness Areas. These wilderness areas are at distances ranging from 5km to 22km from the Telluride Substation. Potential visibility impacts were not documented for the West Elk, La Garita or Weminuche Wilderness Areas, nor at the Black Canyon/Gunnison National Park.

Emergency Generator Alternative – For the Emergency Generator scenario, two small Solar Titan 130 generators were assumed. The VISCREEN Level II modeling analyses showed that the Emergency Generator scenario had the potential to impact visibility conditions at the Mt. Sneffels Wilderness Area, that lies within 5km of the Telluride Substation, and at the Lizard Head and Big Blue Wilderness Areas. Similar to the Small Generator Alternative, potential visibility impacts were not documented for the other wilderness areas evaluated.

In summary, the VISCREEN Level II analyses indicates that:

- The Large, Small and Emergency Generation Alternatives all have the potential to impact visibility conditions at nearby wilderness areas including Mt. Sneffels (Class II, 5km away), Lizard Head (Class II, 15 km away) and Big Blue (Class II, 22 km away).
- Among the three generator scenarios evaluated in this EIS, the Large Generator Alternative has the greatest potential for visibility impacts on wilderness areas. The VISCREEN Level II model documented that this alternative would have potential visibility impacts at all wilderness areas, except Black Canyon/Gunnison (Class I, 70 km away) and West Elk (Class II, 82 km away).
- Results for the Small Generator and Emergency Generator scenarios were the same. The operation of the Emergency Generator only during an outage, however, would reduce the potential for this alternative to impact visibility conditions at wilderness areas in comparison to the Small Generator Scenario.

Should a Generation Alternative be proposed by another energy developer in the future, additional air quality and visibility analyses would be conducted if federal permitting for the project were required. Additional analyses would be conducted to refine and quantify visibility impacts for a specific proposed site and generator facility, as well as determine the significance of impacts and whether effective mitigation measures could be used to reduce impacts to a level less than significant.

3.2.2.7 NO ACTION ALTERNATIVE

The No Action Alternative would avoid the short-term, construction-related and long-term operation air quality impacts described in this section for the Transmission and Generation Alternatives. Maintenance of the existing 69 kV line would continue and increase over time as the existing line continues to degrade. The impacts of ongoing maintenance to air quality would be low.

3.3 GEOLOGY, PALEONTOLOGY, MINERALS

ISSUES: Geologic hazards exist in the project area, including areas subject to avalanches, landslides and unstable slopes. Project construction could further increase these hazards, particularly in areas of steep slopes, due to the activities of construction equipment and vehicles. These conditions could also pose a threat to the long-term stability of the Project.

The project area also contains geologic formations that may contain scientifically important paleontological fossils or mineral resources of commercial value that could be impacted by the alternatives.

3.3.1 AFFECTED ENVIRONMENT

The project area bridges two distinctly different geologic settings. The northwest end of the Project, beginning near Nucla, runs along the west side of the Uncompahgre Plateau, which is a large monocline of Cretaceous sedimentary rock. The project area then spans southeasterly across undulating plateaus characterized by flat-topped mesas and deep canyons. The project area skirts or crosses the canyons which are a series of north-south trending drainages, incised into a layer-cake of Mesozoic sediments. The southeasterly extent of the project area reaches the fringe of the San Juan Mountains where the layers of sedimentary rocks are warped upwards against the Tertiary intrusive mass of the mountain range.

The general geologic formations associated with the project area are shown in ***Plate GEO-1***. About 75 percent of the project area is underlain by Cretaceous and Jurassic sedimentary formations that are about 80 to 150 million years old. Approaching the San Juan Mountains near Telluride, the sedimentary layers are warped upwards so that older Triassic and Permian formations are exposed in the deeper canyons. These sedimentary formations are as old as 250 million years. Uplifting along the margins of the San Juan Mountains has generated faults and fractures that have become avenues for the upwelling migration of igneous rocks and mineral-rich fluids. Tertiary intrusives only 40 million years old are found towards the south end of the project area along with a basalt flow that may be only a few million years old. In most cases, the bedrock formations are cloaked under a veneer of Quaternary surficial deposits consisting of alluvium, colluvium, landslide debris, and glacial drift. Descriptions of the geologic formations and typical geologic hazards are contained in *Table 3.3-1*.

GEOLOGICAL HAZARDS

Geologic hazards exist throughout the project area due to the interaction of climate and topography with geologic formations. These hazards include avalanches, landslides, rockfall, mud and debris flows, slope failure, seismic risk, radioactivity, ground subsidence, expansive soil and rock. ***Plates GEO-2, GEO-3*** and ***GEO-4*** show various geologic hazards in the project area. The very steep slopes in the project area, defined as soils containing slopes over 50 percent (see ***Plate GEO-3***), have the highest potential for geological hazards and were identified from the NRCS soil survey. (See Section 3.4, Soils). Areas of known landslide and debris flow areas are based on field reconnaissance, review of aerial photographs and available documentation (see ***Plate GEO-2***).

Seismic Risk The western section of Colorado, including the project area, has been identified as lying within Seismic Risk Zone 1 (*Uniform Building Code*). In this zone, distant earthquakes may be expected to cause only minor damage to structures having fundamental periods of vibration greater than 1.0 second. There are no known earthquake epicenters within the project area. The closest known epicenter is at Telluride where a Modified Mercalli Intensity III to V earthquake was felt sometime between 1870 and 1979 (Kirkham and Rogers 1981).

Table 3.3-1
Geologic Formations

Age	Map Unit	Formation	Description	Potential Hazards
Quaternary	Qae	Alluvium and Eolian Deposits	Alluvium are recent unconsolidated stream deposits, moderately well sorted, ranging from clays to gravels and cobbles. Eolian deposits are windblown silt and sand that can be reworked by water.	High water table Flooding Erosion
	Qa	Alluvium	Recent unconsolidated stream deposits, moderately well sorted, ranging from clays to gravels and cobbles.	High water table Flooding Erosion
	Qb	Basalt	Extrusive, dark, vesicular (containing cavities or pores) basalt lava flows. Often form resistant caprock layer.	Rockfall May require blasting
	Qc	Colluvial Deposits	Weathered material transported by gravity that is unsorted and undifferentiated. Includes talus, block rubble, slope wash.	Slope failures Erosion Rockfall
	Qd	Glacial Drift	Glacial and fluvio-glacial material consisting of unsorted and unstratified gravels to boulders in a clayey sand matrix. Can be modified by weathering and erosion.	Slope failures Erosion Rockfall
	Ql	Landslide Debris	Mass wasting (gravity) deposits of unconsolidated, poorly sorted, rock debris, which may be angular, and range in size from clays to boulders.	Unstable slopes Rockfall Slope failure
Tertiary	Ti	Tertiary Intrusive	Dense, hard, fine-grained igneous rock which has formed from cooling of magma.	Debris flows May require blasting
Cretaceous	Kdb	Dakota and Burro Canyon	Dakota is hard quartzose sandstone and pebble conglomerate with shale and siltstone interbedded. Burro Canyon is sandstone and siltstone with soft claystone interbedded.	Debris flows Rockfall Radioactivity Shrink/swell potential May require blasting
	Km	Mancos Shale	Dark gray to black, soft, fissile,(thinly bedded) marine shale with interbedded sandstone, siltstone, limestone and bentonite (volcanic ash).	Erosion Swelling Slope failure
	Kd	Dakota	Dakota is hard quartzose sandstone and pebble conglomerate with shale and siltstone interbedded.	Rockfall May require blasting Debris flows
Jurassic	Jmb/ Jme	Morrison	Variegated fluvial (river) and lacustrine (lake) deposited shale, mudstone and sandstone with occasional limestone.	Radioactivity Shrink/swell potential Debris flows Slope failure
Triassic	Td	Dolores	Reddish fluvial (river) siltstone, sandstone and shale with occasional thin layers of limestone conglomerates.	May require blasting Rockfall Slope failure
Permian	Pc	Cutler	Gray, purple or red undifferentiated fluvial (river) micaceous sandstone, siltstone and conglomerate	Rockfall May require blasting

Source: U.S. Geologic Society, Preliminary Geologic Map of Colorado, miscellaneous field studies, two sheets, 1976 and various references.

The Colorado Geological Society (CGS) has published an inventory of potentially active faults in Colorado (Kirkham and Rogers 1981-1982). The report does not identify any potentially active faults in the project area or immediate vicinity. One large inactive fault shown in the project area (***Plate GEO-1***), is the Black King Fault, which runs generally east-west in the vicinity of the Oak Hill Substation. Numerous minor faults have been mapped by various investigators and shown on published geologic reports for the area. Detailed site investigations pursuant to locating specific transmission line components may encounter other small, inactive faults within the corridor routes.

Avalanches Avalanches generally occur on northerly facing, open slopes between 30° and 45° at altitudes in excess of 7,500 feet Above Mean Sea Level (amsl). The highest level of hazard is found where such slopes are in the lee of prevailing winds, where deep snow and/or cornices develop. No avalanche tracts were identified within the alternative transmission routes under consideration. However, small avalanches can develop even on well-timbered slopes under unusually severe snow conditions and areas identified as containing very steep slopes may have avalanche danger.

Landslides and Unstable Slopes According to the CGS, the term "landslide" is used to describe a wide variety of processes that result in the downward and outward movement of slope-forming materials composed of rocks, soils, artificial fill, or a combination thereof. The materials may move by falling, toppling, sliding, spreading, or flowing (Weber and Brown 1988). Natural factors that can result in landslides include long-term changes in climate, removal of slope support through erosion, and loss of rock strength through weathering. Short-term natural triggering of landslides can result from earthquakes. Areas identified as very steep slopes or areas of known landslide and debris flow (see ***Plates GEO-2*** and ***GEO-3***) have the highest risk of landslide.

Rockfall Rockfall is a special type of landslide usually associated with detachment of rock fragments from outcropping bedrock within or above steep slopes. The falling, sliding, bounding, or rolling rock fragments can generate significant velocities and impact energies. This hazard is highest in areas of very steep slopes coupled with shallow bedrock or rock outcrops.

Mud and Debris Flow The CGS has described a mudflow (including earthflow and debris flow) as... "a geologic phenomenon whereby a wet, viscous fluid mass of fine-to coarse-grained material flows rapidly and turbulently downslope, usually in a drainageway. This results typically from torrential rainfall or very rapid snowmelt runoff that initiates rapid erosion and transport of poorly consolidated surfical materials that have accumulated in the upper reaches of the drainage basin" (*Colorado Geological Survey, Special Publication No. 6,* Rogers et al. 1974). The risk for mud and debris flow increases with the steepness of slope. Areas of known debris flows are shown in ***Plate GEO-2***.

Radioactivity The release of radiation through decay of radioactive materials within soil and rock material is a natural, continuous process that is unaffected by human activity. The Placerville Uranium District has been delineated in ***Plate GEO-4***, along with any known mines. No waste dumps or tailings piles have been delineated on the map but some amount of waste material can be expected to be present around the entrances to mine shafts. A hazard may exist in steep canyon areas with uranium bearing formations and in areas that disturb uranium mine wastes and/or dumps.

Ground Subsidence Ground subsidence can be caused by removal of groundwater from fine-grained aquifers, hydrocompaction of certain low-density and weak soils, dissolution of soluble rock and soil materials, and through collapse of underground mine workings. The risk of ground subsidence is higher in soils noted by the National Resource Conservation Service (NRCS) as having poor strength or as being moisture sensitive as shown in ***Plate GEO-2*** (see Soils, Section 3.4).

Expansive Soil and Rock Expansive soil and rock materials have higher risk for soil movement and instability. Those soils described by the NRCS as having high potential for shrink/swell are shown in ***Plate GEO-2*** (see Soils, Section 3.4).

PALEONTOLOGY

Paleontologic resources occur within geologic formations where fossilized remnants of prior lifeforms have been found or are known to occur. These remnants may be body parts, vegetative matter, tracks, borings, gastroliths, or coprolites. Fossils are most commonly found in sedimentary rock formations where rapid burial has protected the remains from decay and disintegration. However, some fossils have been found within volcanic deposits. The geologic formations in the project area known to have significant potential for fossils are the Morrison, Dolores, and Cutler formations (see ***Plate GEO-1***). The Cutler deposits have been known to contain a variety of ferns and scaled trees as well as brachiopods, mollusks, and crinoids. Fishes were also common along with amphibians and reptiles. The Dolores deposits may contain coniferous trees, palm-like cycads, coral, mollusks, some fishes and amphibians, and reptiles including both marine and land-dwelling (dinosaur) forms. The Morrison deposits are famous for dinosaur remains but also may contain freshwater invertebrates, mollusks, arthropods, echinoderms, reptiles, primitive mammals, and land plants, including numerous conifers and cycads.

The specific paleontologic resources that have been identified in the project area are Permian vertebrates within the Cutler formation and palm-like plants in the Dolores Formation. Both of these paleontologic resources have been found in formation exposures in the Placerville area and along the Fall Creek drainage (Fike 1998: pers. comm.).

The H-8270-1 General Procedural Guidance for Paleontological Resource Management (BLM 1998) describes three conditions for classification (ranking) of areas according to their potential to contain paleontologic resources. Brief descriptions of the three conditions, and associations with the geologic formations within the project area, are given in *Table 3.3-2* (Armstrong 1999: pers. comm.).

Table 3.3-2
Paleontologic Conditions

Condition (BLM H-8270-1)		Associations*	Age
1	Areas known to contain vertebrate fossils or noteworthy occurrences of invertebrate or plant fossils	Morrison Dolores Cutler	Jurassic Triassic Permian
2	Areas with exposures of geologic units or settings that have high potential to contain vertebrate fossils or noteworthy occurrences of invertebrate or plant fossils	Mancos Burro Canyon Dakota	Cretaceous Cretaceous Cretaceous
3	Areas very unlikely to produce vertebrate fossils or noteworthy occurrences of invertebrate or plant fossils	Alluvium/Eolian/Colluvium Glacial and Landslide Basalt Tertiary Intrusive	Quaternary Quaternary Quaternary Tertiary

**Association as described by Harley Armstrong, BLM, April 28, 1999.*

MINERAL RESOURCES

There are three general types of mineral deposits potentially found in the vicinity of the transmission corridors. These are precious metals, energy producing deposits (including oil, natural gas, coal, and uranium), and industrial minerals (see ***Plate GEO-4***).

PRECIOUS METALS

As discussed in the geology section, the uplifting, faulting, and magmatic intrusion that created the San Juan Mountains was accompanied by the injection through faults and fractures

of mineral rich fluids. This resulted in a network of mineralized veins and pockets of precious metals, particularly gold and silver and to a lesser extent lead and zinc. Although many faults and fault systems connected to the mineralized district surrounding Telluride extend into the project corridor, no mineral occurrences have been identified or are known to occur within the project area. However, natural weathering and erosion of mineral bearing formations can produce placer deposits of precious metals within streambed gravels that may have been transported considerable distances from their original sources. Such deposits are known to occur along the San Miguel River, especially in the Placerville area. The only exposure to potential placer deposits along the study corridor is within the San Miguel River alluvium in the vicinity of the Telluride Substation. Although some placer deposits have been mined in the past, the low-grade deposits that may exist along the San Miguel River are generally thought to be uneconomical and not susceptible to mining in the future.

Energy Producing Deposits

Coal The most prevalent of the energy producing resources in the project area is coal. It is known to occur in relatively thin beds within the Dakota Sandstone formation. ***Plate GEO-4*** shows where deposits of bituminous (strippable) or subbituminous coal are generally found through the project area and was produced from the Energy Resources Map of Colorado (CGS 1977). In the northern portion of the project area the coal may occur at depths of less than 150 feet, while towards the southern end of the project area the deposits are generally covered by up to 3,000 feet of overburden. The Energy Resources Map (CGS 1977) shows two active coal mines in the project area, a strip mine near Nucla and an underground mine west of Norwood. A number of abandoned underground coal mines are also shown in these two areas. Review of Montrose County's land use mapping (computer-supplied by Montrose County, 1998) shows that the strip mine near Nucla is still active and located one-fourth mile west of the study corridor, near the Nucla Substation. Montrose County also shows active coal exploration occurring within the study corridor approximately 6 miles south of Nucla. The Colorado Division of Minerals and Geology (computer printout of 1998 database of permitted mining operations) provided listings of coal mining operations within San Miguel County. Two additional coal mines were noted near the project area, in the Norwood vicinity, but fall outside the one-fourth mile buffer of the study corridor.

Uranium The second most prevalent energy resource is the Placerville Uranium Belt, which is shown in ***Plate GEO-4***. It is located along the north side of the project area in the vicinity of Placerville (CGS 1977). The radioactive deposits in the Placerville area are found within the Jurassic Entrada formation, a relatively thin bed (40 to 75 feet thick) that outcrops along the side of the San Miguel Canyon and its tributaries. The ore deposits are found in the upper 25 feet of the formation and in most places are only a few inches thick, but locally they can thicken to over 20 feet and be several hundreds of feet wide. The transmission corridor passes through extensions of uranium bearing formations between Saltado and Fall Creek drainages. There are no active uranium mines within the study corridor or one-fourth mile buffer (Colorado Division of Minerals and Geology 1998). The mining that has occurred in the area was underground workings that extracted ore from enriched or thickened zones, which were evidently not plentiful. The ore bodies and mine workings are, therefore, only found along the canyon walls where the uranium bearing strata are exposed. Numerous abandoned mines in the area of Sawpit, as shown on the topographic mapping by U.S.G.S. (7.5-minute series, Little Cone Quadrangle 1953), are probably from uranium extraction.

Oil and Gas Oil and gas explorations undertaken throughout western Colorado have resulted in delineation of the Paradox Basin as a favorable sedimentary structure. This basin is located just to the west of the project area. *The Oil and Gas Fields Map of Colorado*, (CGS 1991), does not show any fields within or adjacent to the project area. The nearest oil field shown is approximately 8 miles southwest of Redvale on Hamilton Creek. In 1996 there were no producing wells in the study corridor or one-fourth mile buffer (Shelton 1998, pers. comm.).

Between 1991 and 1997, there were no new exploratory wells in the project area. In 1997 and again in 1998 there was exploratory drilling around the existing field on Hamilton Creek, 2 to 3 miles south of the project area.

INDUSTRIAL MINERALS

Industrial minerals mined in the project area include sand, gravel, and limestone. Commercially viable deposits of sand and gravel are found in isolated pockets along Naturita Creek and in channel deposits and fluvial terraces associated with the existing and ancestral San Miguel River. A printout of permitted mining operations (Colorado Division of Minerals and Geology 1998) was reviewed and showed eight permitted sand and gravel operations within the project area and one limestone operation, as shown in ***Plate GEO-4***. Five of the sand and gravel sites were in the Nucla to Norwood area, one was near Sawpit, and the other two were near the Telluride Substation. There are numerous inactive sand and gravel mines in the area. Limestone lenses have been found within the Dolores formation. The one permitted mine, near the east end of the project area, is from an outcrop that occurs along the wall of the San Miguel River Canyon near the old townsite of Lime.

MINERAL LEASES/CLAIMS

The Bureau of Land Management has an extensive database of mining claims throughout the project area. The majority of these claims have been closed. Seven remaining claims are located in the project corridor as shown in ***Plate GEO-4***. Six of these are immediately east of the Nucla Substation, with the seventh located along the San Miguel River, west of the Telluride Substation. Several other claims are shown in ***Plate GEO-4*** within the one-fourth mile buffer.

3.3.2 ENVIRONMENTAL CONSEQUENCES

Environmental consequences related to geology, paleontology and mineral resources within the project area may occur both short-term, from construction activities, and long-term from land disturbance, from the location of permanent structures and from ongoing maintenance operations.

3.3.2.1 ANALYTICAL FRAMEWORK

Geotechnical issues evaluated for the transmission alternatives include the potential effects that geologic conditions may have on the construction of the Project and whether the Project would, in turn, increase hazards related to landslides and slope instability. This section of the EIS also discloses the results of geotechnical studies that were conducted to determine the feasibility of undergrounding the line across portions of Specie, Wilson and Sunshine Mesas (Underground Subalternative). Potential impacts to paleontological resources and minerals of commercial value are also discussed.

POTENTIAL TYPES OF IMPACTS

GEOLOGIC IMPACTS

No impact to the geology of the project area is anticipated from the proposed Project. However, the Project could increase the potential for, or be susceptible to, the following types of geological hazards:

- ***Slope Instability:*** Impacts to slope stability may occur due to: 1) construction activities across unstable slopes, 2) the removal of vegetation and construction disturbances occurring immediately above a sensitive slope, 3) vibrations from adjacent construction activities, and 4) cut or fill on unstable slopes for roads or structures. Reduced slope stability can increase hazards of landslide, rockfall and debris flow.

- ***Increased Runoff:*** Increased runoff of storm water may occur due to removal of vegetation or changes in runoff patterns caused by construction activities. Increased runoff may result in slumping or landslide activity in areas of shallow bedrock, weak soil, moisture sensitive formations and steep slopes.

- ***Increased Erosion Potential:*** Damage to, or removal of, vegetation and construction of cut and fill slopes may increase erosion potential by leaving soils exposed. Hazards of mudslides and debris flows would increase as erosion potential increases, particularly in areas of steep slopes with shallow bedrock. Under certain conditions (*i.e.* slope, exposure and elevation) these activities may also increase avalanche hazards. In areas of steep canyon sidewalls these activities may increase exposure of uranium bearing formations.

- ***Subsidence:*** Construction in areas of mining or exploration activity may result in land subsidence due to failure of slopes associated with surface mining or failure of structures associated with underground mining and exploration.

- ***Vibration Effects:*** In areas shown to have shallow bedrock, construction methods may require blasting. Sensitive areas such as landslide areas, debris flow areas, rockfalls and unstable slopes may exhibit increased hazards due to the resultant vibrations.

Definition of Geologic Impact Levels

The following criteria were used for defining geologic hazards and impact levels for the project alternatives:

- ***High Impacts:*** Potential impacts are considered high where construction activities would affect areas containing very steep slopes (more than 50 percent) and where construction would occur in areas of known landslide or debris flow activity. High impacts may also occur in construction areas of known mining or exploration activity, as shown in *Plate GEO-4* and in areas of steep canyon slopes with uranium bearing formations.
- ***Moderate Impacts:*** Potential impacts are considered moderate where construction activities may affect areas containing steep slopes (30 to 49 percent) combined with rock outcrops, shallow bedrock, weak soils or moisture sensitive soils (high shrink/swell potential).
- ***Low Impacts:*** Potential impacts are considered low where construction activities may affect rock outcrops, shallow bedrock, weak soils and moisture sensitive soils (high shrink/swell potential) in areas outside steep and very steep slopes.
- ***No Identifiable Impacts:*** No identifiable impacts are anticipated where construction occurs outside of low, moderate and high impact areas. Due to the low seismic risk in the project area, there are no identifiable impacts related to faults.

Paleontologic Impacts

Potential impacts to paleontologic resources may occur where the Project crosses geologic formations that have significant potential for fossils and where access to potential resource areas is increased due to project construction. Geologic formations with paleontologic potential have been identified in the project area as the Morrison, Dolores and Cutler formations as shown in *Plate GEO-1*. Impacts to paleontological resources could occur as a result of earth disturbance, excavation activities and vegetation removal that would expose and potentially damage this resource.

Definition of Paleontologic Impact Levels

The following criteria were used for defining the potential impacts on paleontological resources from the project alternatives:

- ***High Impacts:*** Potential impacts are considered high where construction activities would affect areas of known paleontologic sites.
- ***Moderate Impacts:*** Potential impacts are considered moderate where construction activities affect geologic formations with paleontological resource potential, including areas identified in ***Plate GEO-1*** as Morrison, Dolores and Cutler formations.
- ***Low Impacts:*** Potential impacts are considered low where project construction activities affect geologic formations identified with the Lower Cretaceous period in ***Plate GEO-1***: (*i.e.* Dakota, Mancos and Burro Canyon formations).
- ***No Identifiable Impacts:*** No identifiable impacts are anticipated where construction activities would occur outside the low, moderate and high impact areas.

MINERAL IMPACTS

Active mining in the project area is minimal. Construction of the Project is anticipated to avoid all active mining operations. Future mining and exploration could be compromised by the Project if permanent structures are in conflict with proposed mining activities. Hazards related to closed mining sites and uranium-bearing formations are addressed under Geology. Types of impacts that could occur include:

- Damage to active mining operations due to construction in the immediate vicinity of, and in conflict with, current operations.
- Impact to future mining and exploration due to location of permanent structures in conflict with proposed operations.

DEFINITION OF MINERAL RESOURCE IMPACT LEVELS

The following criteria were used in assessing impact levels for mineral resources:

- ***High Impacts:*** An impact would be considered high for any construction that cannot avoid existing mining operations.
- ***Moderate Impacts:*** An impact would be considered moderate for any construction immediately adjacent to existing mining operations or unexpired mining leases that may result in limitations for future development or expansion of mining activities.
- ***Low Impacts:*** Impacts would be considered low for any construction within one-fourth mile of existing mining operations or unexpired BLM mining leases.
- ***No Identifiable Impacts:*** No identifiable impact would be considered for construction outside of areas as defined for low to high impact where potential for future mining activities are unknown.

APPLICABLE PERMITS, STANDARDS AND ORDINANCES

There are no known permit requirements specific to geology or minerals. As part of the general project permitting, the BLM would require a Permitted Paleontologist to perform a field survey of the canyon areas and exposed bedrock (rock outcrops) within the construction corridor. This pedestrian survey would be required on public BLM lands prior to start of construction. The survey would allow the BLM to further identify and avoid sensitive paleontologic resources.

ENVIRONMENTAL PROTECTION MEASURES

Tri-State has committed to implementing a number of Environmental Protection Measures for the overhead transmission alternatives, as shown on *Tables 2.2-4*. Many of these measures would reduce or eliminate concerns to these resources, specifically those related to limiting

areas of disturbance. Applicable measures are listed as numbers 1, 5, 23, 25, 26, 27, 30, 33 and 50. Best Management Practices required on federal lands (*Table 2.2-5*) are numbers 9, 10, 12 and 25.

The major impact to geology, paleontology and mineral resources would occur from disturbance during the construction phase, primarily due to access road clearing and construction. No major new roads are proposed, existing roads may be increased to 12 to 14 feet in width where existing roads are inadequate and minor spur roads may be constructed to pole locations. Overland construction and helicopter construction is proposed for areas with no existing roads and these construction methods would eliminate major clearing and grading activities.

3.3.2.2 IMPACTS OF THE PRIMARY TRANSMISSION ALTERNATIVES

Nucla-Norwood Northern Alternative

115 kV Transmission Line Effects

Geologic Impacts. This alternative would entail rebuilding the existing 69 kV line as a 115 kV system between the Nucla Substation and the Norwood Substation. Existing access and overland construction would be used over the majority of this alignment, which would limit land disturbance. Potential impacts and geologic hazards associated with this alternative are summarized in *Table 3.3-3*. Impacts are considered potentially high for 1.7 miles along the alignment where very steep slopes would be traversed. These areas are generally related to canyon slopes at natural drainages and would be primarily constructed (1.6 miles) using existing access or overland construction. There are no known landslide or debris flows. In addition, potentially high effects are identified at three locations where mining operations are in close proximity to the alignment.

Moderate impacts would occur along 0.3 mile of the alignment due to the presence of steep slopes combined with rock outcrops, shallow bedrock, weak soil or soils with high shrink/swell potential. The areas of moderate impact occur where existing access or overland construction is proposed. Potential for low impacts would occur for 2.0 miles where the alignment crosses rock outcrops, shallow bedrock, weak soils or soils with high shrink/swell potential. The areas of low impact occur where existing access or overland construction is proposed.

Paleontological Impacts. Potential effects to paleontological resources include moderate impacts for 6.5 miles where the alignment crosses the Morrison formation and low impacts for 4.8 miles where the alignment crosses formations associated with the Lower Cretaceous period (see *Table 3.3-3*). Since there is limited improved access proposed for this alternative, no additional impact to paleontologic resources is anticipated.

Mineral Resource Impacts. Potential for high impacts would occur at two locations on this alignment, in Link 1 near mile marker 8 and near mile marker 9. Potential for moderate impacts would occur at two locations, in Link 1 near mile marker 0.5 and near mile marker 1, due to unexpired leases in close proximity to the proposed transmission line. Potential for low impacts would occur at two locations in Link 1, near mile marker 0.5, and again at mile marker 2.0, due to unexpired leases and mining operations within one-fourth mile of the line.

Substation Effects

Site grading at the Norwood Substation, Site A, would disturb approximately 2.0 acres and would result in cuts up to 10 feet in height and fill slopes up to 7 feet in height. The proposed expansion is in an area with slopes of approximately 10 to 15 percent with potential for

shallow bedrock and high shrink/swell and high erosion. The formation in the area of the site is associated with the Lower Cretaceous period. The potential impact for both geological and paleontologic resources is low. There are no known mining operations or mineral leases within one-fourth mile of the Norwood Substation and no identifiable impact is anticipated.

Table 3.3-3
Impacts in the Nucla - Norwood Alternatives
Geology and Paleontology

Impact Characteristic	Northern Alternative	Central Alternative	Southern Alternative
High Impacts:			
Crosses Very Steep Slopes :			
Existing Access and Overland Construction	1.6 miles	2.6 miles	0
Improved Access	0.1 mile	2.2 miles	2.7 miles
Helicopter Construction	0	0.5 mile	0.6 mile
Close Proximity to Known Mining Activity	3.0 miles	4.0 miles	2.0 miles
Crosses Very Steep Slopes with Uranium Potential	0	0	0
Close Proximity to Known Paleontologic Site	0	0	0
Moderate Impacts:			
Crosses Steep Slopes with Other Constraints* :			
Existing Access and Overland Construction	0.3 mile	0	0
Improved Access	0	0	0.2 mile
Helicopter Construction	0	0	0
Crosses Morrison, Cutler or Dolores Formations:			
Existing Access and Overland Construction	6.0 miles	0.9 mile	0
Improved Access	0.5 mile	1.6 miles	1.7 miles
Helicopter Construction	0	0	0.3 mile
Low Impacts:			
Crosses Soils with Other Constraints*:			
Existing Access and Overland Construction	2.0 miles	1.3 miles	0.2 mile
Improved Access	0	0	0
Helicopter Construction	0	0	0
Crosses Formations Associated with Lower Cretaceous Period:			
Existing Access and Overland Construction	4.8 miles	1.6 miles	1.2 miles
Improved Access	0	8.2 miles	11.0 miles
Helicopter Construction	0	0.2 mile	0.4 mile
No Impacts:			
	1.2 miles	0.2 mile	0.2 mile

** Other Constraints: weak soils, rock outcrops, shallow bedrock, high shrink/swell potential*

69 kV Transmission Line and Distribution System Effects

Since this alternative entails rebuilding the existing 69 kV line as a 115 kV system, no additional impacts, beyond those described above for the 115 kV transmission line, would occur.

Nucla-Norwood Central Alternative

115 kV Transmission Line Effects

Geologic Impacts. This alternative would entail improving access for 12.3 miles, generally through areas where low impacts would be anticipated. Some areas of potential moderate or high impact would be encountered at canyons due to steep slopes. The remainder of the alignment would utilize existing access or overland construction, with helicopter construction at the Naturita Creek drainage. *Table 3.3-3* summarizes the potential geologic hazards and impacts of this alternative. There are 5.3 miles with potential high impacts due to areas of very steep slopes, 2.2 of these miles are shown to require improved access. There are no known landslide or debris flows. There is potential for high impact at four locations due to a mining operation in close proximity to the transmission line.

There are no areas of potential moderate impacts. Potential for low impact occurs for 1.3 miles where the transmission line crosses rock outcrops, shallow bedrock, weak soils or soils with high shrink/swell potential.

Paleontological Impacts. The potential impacts to paleontological resources are assessed as moderate for 2.5 miles where the line would cross the Morrison formation, with 1.6 of these miles requiring improved access. Potential for low impact, where the line would cross formations associated with the Lower Cretaceous period, occurs for 10 miles with 8.2 of these miles requiring improved access (see *Table 3.3-3*).

Mineral Resource Impacts. Potential for high impact occurs at three locations on this alignment, near mile marker 6 in Link 4, and mile markers 0 and 5 in Link 5. Potential for moderate impact does not occur. Potential for low impact occurs near mile marker 0.5 in Link 4 due to mining operations within one-fourth mile of the line.

Substation Effects

Impacts at the Norwood Substation Expansion, Site A, would be the same as described previously for the Nucla-Norwood Northern Alternative.

69 kV Transmission Line and Distribution System Effects

This alternative would entail dismantling 11.6 miles of the 69 kV line from the Nucla Substation to Link 2. Impacts to geologic resources from the dismantling of the 69 kV line would be similar to those described for the Nucla-Norwood Northern Alternative 115 kV transmission line but slightly reduced, with 1.2 miles of potentially high impact due to areas of very steep slopes, generally related to canyon slopes at natural drainages. Potentially moderate impact due to steep slopes combined with rock outcrops, shallow bedrock, weak soil or soils with high shrink/swell potential would occur along 0.3 mile. Potential for low impact occurs for 0.6 mile in areas outside steep slopes where the transmission line crosses rock outcrops, shallow bedrock, weak soils or soils with high shrink/swell potential. There are no known landslide or debris flows. With no new construction, no impact is anticipated to paleontologic or mineral resources that are in proximity to mining operations.

Nucla-Norwood Southern Alternative

115 kV Transmission Line Effects

Geologic Impacts. This alignment would require construction of improved access for 15.0 miles, with 4.2 miles proposed as helicopter construction and the easterly 1.5 miles utilizing existing access and overland construction. *Table 3.3-3* shows the geologic hazards and impacts associated with this alternative. There are 3.3 miles with potentially high impact for this alignment due to areas of very steep slopes, primarily associated with canyon crossings. Of these 3.3 miles, 2.7 require improved access. There are no known landslide or debris flows. There are two locations with potential for high impact due to a mining operation in close proximity to the transmission line.

Potential moderate impacts could occur for 0.2 mile due to steep slopes combined with rock outcrops, shallow bedrock, weak soil or soils with high shrink/swell potential. Potential for low impact occurs for 0.2 mile where the transmission line crosses rock outcrops, shallow bedrock, weak soils or soils with high shrink/swell potential.

Paleontological Impacts. The potential impacts to paleontological resources are assessed as moderate for 0.2 mile where the line would cross the Morrison formation. Within the 15.0 miles of improved access, there are 11.0 miles with potential low impact to paleontologic resources where the line would cross formations associated with the Lower Cretaceous period. There is an additional 1.6 miles with potential low impact where improved access is not required (see *Table 3.3-3*).

Mineral Resource Impacts. Potential for high impact occurs at two locations on this alignment, near mile marker 6 in Link 4, and mile marker 0 in Link 6. Potential for moderate impact does not occur. Potential for low impact occurs near mile marker 0.5 in Link 4 due to mining operations within one-fourth mile of the line.

Substation Effects

Impacts of expanding the Norwood Substation, Site A, would be the same as described previously for the Nucla-Norwood Northern Alternative.

69 kV Transmission Line and Distribution System Effects

This alternative would entail dismantling 15.3 miles of the 69 kV line from the Nucla Substation to the Norwood Substation (Links 1, 2 and 3). Impacts to geologic resources from dismantling the 69 kV line would be similar to those described for the Nucla-Norwood Northern Alternative 115 kV transmission line. There are 1.7 miles with potential high impact due to areas of very steep slopes generally related to canyon slopes at natural drainages. Potentially moderate impacts due to steep slopes combined with rock outcrops, shallow bedrock, weak soil or soils with high shrink/swell potential would occur along 0.3 mile. Potential for low impact occurs for 2.0 miles in areas outside steep slopes where the transmission line crosses rock outcrops, shallow bedrock, weak soils or soils with high shrink/swell potential. There are no known landslides or debris flows. With no new construction, no impact is anticipated to paleontologic resources that are in proximity to mining operations.

Norwood-Sunshine Alternative

115 kV Transmission Line Effects

Geologic Impacts. This alternative would consist of rebuilding the existing 69 kV line as a 115 kV system between the Norwood Substation and the Sunshine Substation. *Table 3.3-4* summarizes the geologic hazards and impacts associated with this alternative. The 115 kV transmission line would cross five drainages: Beaver Creek, Saltado Creek, Fall Creek, Bilk Creek and South Fork, where potential impact is considered high (3.2 miles) due to steep slopes and known landslide and debris flows. Fall Creek and Saltado Creek are also areas with underlying uranium deposits. The Beaver Creek crossing is proposed to be constructed by helicopter only. The Saltado Creek crossing is in an area of proposed road improvements such as road widening or construction of spur roads to pole sites. Fall Creek and South Fork crossings would utilize helicopter construction or existing limited access, and Bilk Creek is in an area where existing access and overland construction would be used. There is one location of potential high impact due to proximity of mining operations at Bear Creek (Link 15, mile marker 1.3).

Table 3.3-4
Impacts in the Norwood-Sunshine and Norwood-Telluride Alternatives
Geology and Paleontology

Impact Characteristic	Norwood-Sunshine	Norwood-Telluride
High Impacts:		
Crosses Very Steep Slopes :		
Existing Access and Overland Construction	0.9 mile	3.2 miles
Improved Access	0.4 mile	0.4 mile
Helicopter Construction	1.9 miles	2.6 miles
Close Proximity to Known Mining Activity	1.0 mile	3.0 miles
Crosses Very Steep Slopes with Uranium Potential	0	4.7 miles
Close Proximity to Known Paleontologic Site	0	1.0 mile
Moderate Impacts:		
Crosses Steep Slopes with Other Constraints* :		
Existing Access and Overland Construction	3.4 miles	2.0 miles
Improved Access	0	0
Helicopter Construction	0.5 mile	0
Crosses Morrison, Cutler or Dolores Formations:		
Existing Access and Overland Construction	0.9 mile	0.8 mile
Improved Access	0.5 mile	0.4 mile
Helicopter Construction	1.7 miles	1.3 miles
Low Impacts:		
Crosses Soils with Other Constraints*:		
Existing Access and Overland Construction	2.0 miles	1.7 miles
Improved Access	0.3 mile	0.3 mile
Helicopter Construction	0	0
Crosses Formations Associated with Lower Cretaceous Period:		
Existing Access and Overland Construction	14.6 miles	10.8 miles
Improved Access	0.7 mile	0.7 mile
Helicopter Construction	0	0
No Impacts:		
	0.3 mile	0.5 mile

** Other Constraints: weak soils, rock outcrops, shallow bedrock, high shrink/swell potential*

Potentially moderate impacts could occur for 3.9 miles due to steep slopes combined with rock outcrops, shallow bedrock, weak soil or soils with high shrink/swell potential. Potential for low impact occurs for 2.3 miles where the transmission line crosses rock outcrops, shallow bedrock, weak soils or soils with high shrink/swell potential.

Paleontological Impacts. There are 3.1 miles with moderate potential for paleontologic impact where the line crosses areas identified as the Morrison formation, and these occur primarily at canyon crossings. There are 15.3 miles of potential low impact to paleontologic resources where the line would cross formations associated with the Lower Cretaceous period, 0.7 of these miles requires improved access (see *Table 3.3-4*).

Mineral Resource Impacts. There is no potential for high or moderate impact on this alignment. Potential for low impact occurs in Link 11 near mile marker 0.2 due to mining operations within one-fourth mile of the line, and in Link 15 near mile marker 1.5 due to unexpired leases within one-fourth mile of the line.

Substation Effects

The Sunshine Substation would require minor earthwork activity in an area of potentially moderate geologic impact. No identifiable impacts are expected to occur to paleontological or mineral resources.

69 kV Transmission Line and Distribution System Effects

As the distribution system modifications are primarily in the same location as the proposed transmission line, no additional impact is anticipated over that discussed above for the 115 kV line. The new distribution lines between the Norwood and Oak Hill Substations, which leaves the proposed transmission line corridor, is in an area of low impact.

Norwood-Telluride Alternative

115 kV Transmission Line Effects

Geologic Impacts. This alternative would entail building the new 115 kV transmission line in the existing 69 kV corridor for 16.6 miles before establishing a new corridor across the slopes of the San Miguel River Canyon. See *Table 3.3-4* for a summary of the impacts and hazards of this alternative. The Norwood-Telluride Alternative would cross two drainages, Beaver Creek and Saltado Creek, (Link 13, mile marker 2 and mile marker 10, respectively) where potential impact is high due to very steep slopes. The Beaver Creek crossing is proposed to be constructed by helicopter while the Saltado Creek crossing is in an area where road improvements and spur roads may be constructed. The easterly 12.0 miles of this alignment, beginning at Fall Creek, have potential for high impact due to very steep slopes, known landslide and debris flow areas, and proximity to mining activity. Fall Creek and Saltado Creek are also areas with underlying uranium deposits. Portions of these 12.0 miles (approximately 4.0 miles) are shown to be constructed by helicopter only, or helicopter with existing limited access (2 to 3 miles). The remaining areas would utilize existing access or overland construction. Total mileage with potential for high impact due to crossing very steep slopes is 6.2 miles, with 0.4 mile requiring improved access. Additionally, 4.7 miles of this alignment have high impact due to very steep slopes with uranium potential.

Potential moderate impacts are identified along 2.0 miles of the alignment due to the presence of steep slopes combined with rock outcrops, shallow bedrock, weak soil or soils with high shrink/swell potential.

Potential for low impact occurs for 2.0 miles where the transmission line would cross rock outcrops, shallow bedrock, weak soils or soils with high shrink/swell potential.

Paleontological Impacts. Potentially high impact to paleontological resources is documented for one known paleontologic site (Link 10, mile marker 1). There are 2.6 miles with moderate potential for paleontologic impact where the line crosses areas identified as the Morrison formation and these occur primarily at canyon crossings and along the San Miguel drainage. There are 11.5 miles with potentially low impact to paleontologic resources where the line would cross formations associated with the Lower Cretaceous period, 0.7 of these miles requires improved access (see *Table 3.3-4*).

Mineral Impacts. Potential for high impact occurs at three locations on this alignment, near mile marker 0 in Link 20, and at mile markers 0.6 and 1.7 in Link 21. Potential for moderate impact occurs in Link 20 near mile 0.8 due to an unexpired lease in close proximity to the line. Potential for low impact occurs in Link 11 near mile 0.2 due to mining operations within one-fourth mile of the line.

Substation Effects

The proposed modifications to the Telluride Substation do not require any earthwork activity and no identifiable impacts to geology, paleontology or mineral resources are anticipated.

69 kV Transmission Line and Distribution System Effects

This alternative would entail dismantling the existing 69 kV transmission line for 10.4 miles, along Links 14 and 15, to the Sunshine Substation. In addition, the 69 kV line would be converted to an overhead distribution line in Link 14 from mile marker 0.0 to mile marker 2.1, and converted to an underground distribution line on Wilson Mesa in Link 14 from mile marker 2.1 to mile marker 3.3.

Dismantling of the 69 kV line and making other modifications to SMPA's distribution system would impact three drainage crossings, Fall Creek, Bilk Creek and South Fork, where the potential geologic effects are high due to very steep slopes and known landslide and debris flows. These system modifications do not involve any new construction or structures at Bilk Creek and South Fork and no identifiable long-term impact is anticipated, although short-term impacts may result from construction traffic and removal activities. Potentially high impact has been identified for 1.9 miles associated with very steep slopes. There are 1.9 miles with potential for moderate impact due to steep slopes combined with rock outcrops, shallow bedrock, weak soil or soils with high shrink/swell potential, and 1.7 miles with potential for low impact where the distribution modifications cross rock outcrops, shallow bedrock, weak soils or soils with high shrink/swell potential.

In areas of no new construction, no impact is anticipated to paleontologic resources or to mineral resources. In the areas where new distribution service would be constructed near the Oak Hill and Wilson Mesa Substations, low to moderate impacts to geological and paleontologic resources would be expected.

3.3.2.3 IMPACTS OF THE SUBALTERNATIVES

115 kV Transmission Line Routing Alternatives

Subalternative A: Subalternative A is in an area with potentially high geologic impacts due to very steep slopes and shallow bedrock. This area has potential for moderate paleontologic impacts.

Subalternative B: This subalternative has potential for moderate geologic impacts due to steep slopes combined with rock outcrops, shallow bedrock, weak soil or soils with high shrink/swell potential. No identifiable paleontologic or mineral impacts would occur.

Subalternative C: This subalternative has potential for low geologic impacts due to shallow bedrock and soils with high shrink/swell potential. No identifiable paleontologic or mineral impacts would occur.

Subalternative D: This subalternative has potential for low geologic impacts due to shallow bedrock and soils with high shrink/swell potential. No identifiable paleontologic or mineral impacts would occur.

Subalternative E: Subalternative E is in an area with potentially high geologic impacts due to very steep slopes and known landslides. This area also has potential for moderate paleontologic impacts. Subalternative E would move the existing distribution line away from an existing mining operation and an unexpired lease. In this regard, Subalternative E would reduce potential ongoing conflicts with mineral resources.

Underground Subalternative

The Underground Subalternative would cross portions of Beaver, Specie, Wilson and Sunshine Mesas. Geotechnical studies conducted for these sections of the Norwood-Sunshine line concluded that surficial materials atop the mesas could be excavated using heavy equipment (Buckhorn Geotech 2000). Trenching would be possible in most areas, however, blasting would most likely be required in 10% to 20% of the areas where rocks are encountered.

The geotechnical studies conducted for this subalternative documented areas of severe or moderate limitations for installing an underground cable. Moderate limitations were identified in areas of gentle to steep slopes that are underlain at a shallow depth by Dakota Sandstone or the Morrison formation bedrock materials. Segments with steep slopes combined with areas of erodible soil or soils having a potential for shrink/swell volume changes are also considered to have moderate limitations. Moderate limitations have also been identified where wetland and riparian vegetation or shallow groundwater occurs. All of these areas may present difficulty for excavation, require extra care in bedding and protecting the buried cable, and/or may require dewatering during construction. Along with standard construction mitigation measures, some additional mitigation may be required to dispose of excess rock fragments, dewater trenches, and implement final grading, erosion prevention and revegetation work. Construction through areas of riparian and wetland vegetation may require special permits, construction methods, and mitigation to prevent any net loss of wetlands.

Severely limited areas were defined as those having outcrops of either Dakota Sandstone or Morrison Formation and areas of very steep slopes with highly erodible soils or soils having a potential for shrink/swell volume changes. Undergrounding in the rock outcrop areas may encounter difficulties in excavation or require occasional blasting. Construction on very steep slopes having sensitive soils could result in large areas of disturbance which could require extra precautions to preserve slope stability and/or to mitigate the impacts of construction as it relates to erosion control and revegetation.

The following overall conclusions regarding constraints to undergrounding were reached for each of the mesas.

Across Beaver Mesa, approximately 4.1 miles of the existing alignment have been determined to have moderate limitations to undergrounding the transmission line, primarily due to shallow bedrock. A wetland crossing also occurs that is considered to have moderate limitations. The remainder of the alignment, 1.5 miles, has geotechnical and soil conditions that are opportune for undergrounding.

Across Specie Mesa, 0.6 mile of the existing alignment has severe limitations and 2.9 miles have moderate limitations. Severe limitations include areas with rock outcroppings and very steep slopes. Moderately limited areas are characterized by steep slopes, soils with high erosion potential or high shrink/swell potential, and shallow bedrock conditions. Four drainages are also crossed.

Across Wilson Mesa, 2.1 miles of the existing alignment have moderate limitations to installing an underground cable. Moderately constrained areas are characterized by steep slopes, high erosion potential, and high shrink/swell potential. Two drainages are crossed.

Across Sunshine Mesa, 0.1 mile was identified as having moderate limitations to undergrounding. Moderately constrained conditions include steep slopes.

In summary, undergrounding the transmission line is considered technically feasible across these sections of Beaver, Specie, Sunshine and Wilson mesas. Areas with severe and moderate geotechnical constraints would likely result in additional construction and mitigation requirements, beyond the trenching practices disclosed in Chapter 2.0.

NORWOOD SUBSTATION ALTERNATIVE SITE B

Both sites A and B for the Norwood Substation have the same total size of 2.0 acres. Site B has less earthwork activity and reduced cut and fill heights, which would result in less impact. Site B is located in an area of steep slopes with shallow bedrock and high erosion potential which has potential for moderate geologic impact. This is an area of no identifiable paleontologic impact. With respect to mineral resources, Site B for the Norwood Substation would require construction of a distribution line within one-fourth mile of a mining activity resulting in potential for low mineral resource impact.

3.3.2.4 CUMULATIVE EFFECTS

Other land-disturbing activities that impact areas identified as sensitive (see definition of impact) may produce cumulative impacts if they are performed concurrent with this Project or prior to reestablishment of vegetative cover or other permanent erosion control measures. Where timber sales, timber burns or large areas of land clearing for subdivision development are proposed within areas identified by the Project as having potential for moderate to high impact, project mitigation measures may not be effective due to cumulative impacts, and potential impact would be increased. Potential impacts to paleontologic resources may be increased if other projects utilize the improved access roads to gain new access to sensitive areas.

3.3.2.5 POTENTIAL MITIGATION MEASURES AND RESIDUAL EFFECTS

Standard Mitigation Measures described in *Table 2.2.4* have been proposed by Tri-State as minimum construction standards for the overhead transmission alternatives. *Table 2.2.5* shows additional measures to be required on Forest Service and BLM lands. Mitigation measures for generation alternatives or the undergrounding subalternative would be determined through Tri-State's Special Use Permitting Process in San Miguel County.

The primary standard practices for the overhead transmission alternatives that would limit impacts to geology, paleontology and mineral resources are numbers 1, 5, 23, 25, 26, 27, 30, 33 and 50 from *Table 2.2-4*.

Measures listed in *Table 2.2-5* that should be incorporated into the standard practices for the entire alignment to further mitigate soil impact are numbers 9, 10, 12 and 25.

The following additional methods may be employed to mitigate impacts to geology, paleontology and mineral resources:

1. Retain a Permitted Paleontologist to perform a field survey of the canyon areas and exposed bedrock (rock outcrops) within the construction corridor, as will be required for BLM permit. Have the paleontologist monitor site conditions when construction is in an area of moderate to high potential impact.
2. Notify all mining operations within the study corridor of proposed construction. Visit all known mining operations and determine physical extent of existing operation and potential expansion with relation to proposed construction.
3. Limit disturbance in areas with potentially high impact by use of helicopter construction as outlined in the project description, limiting disturbance to 0.13 acre per structure site. The majority of potentially high impact areas have already been identified as using helicopter construction.
4. Limit disturbance in areas with moderate impact by use of existing roads and overland construction as outlined in the project description, eliminating new road construction. The majority of potentially moderate impact areas have already been identified as using overland construction.
5. Use of erosion control blankets on disturbed slopes over 30 percent to supplement standard erosion controls and revegetation practices.
6. Span areas containing steep or very steep slopes.
7. Abandon and reclaim spur roads and overland trails developed for construction to prevent ongoing use by the public.
8. Implement an erosion control inspection and maintenance program until such time that permanent erosion control measures are attained.
9. Use helicopter methods to perform long-term inspection and maintenance operations in areas of potentially high impact.

During construction of the overhead transmission alternatives, use of these standard practices and additional methods would reduce potentially high and moderate impacts to residual low and no identifiable impacts by limiting the impacts to confined areas within which they would readily be controlled and remediated. By implementation of these measures, which would permanently reclaim and stabilize disturbed areas outside roadways, long-term impacts are anticipated to be low to no identifiable impacts unless reconstruction is required. If reconstruction is required, the mitigation proposed herein should again be implemented to reduce impacts.

3.3.2.6 IMPACTS OF THE GENERATION ALTERNATIVES

Potential geotechnical issues associated with the viable generator sites include slope stability in areas of steep slopes and weak soils. Impacts would vary depending upon specific site conditions, engineering design plans and the degree to which cut and fill requirements would affect sensitive areas. If, in the future, an applicant proposed this type of alternative on federal lands, additional analyses and engineering design information would be required.

3.3.2.7 NO ACTION ALTERNATIVE

The No-Action Alternative would not require any new construction but may require increased use of current roadways for maintenance purposes and reconstruction of existing structures on an "as-needed" basis. Emergency repairs may be required that could have potentially high impacts due to weather and site specific conditions and due to the urgency of the task, which may not allow for implementation of appropriate mitigation measures.

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3.4 SOILS

ISSUES: Soil disturbances would result from construction of any of the action alternatives.

Concerns raised during scoping included the potential for increased sedimentation in water courses, including San Miguel River, the South Fork of the San Miguel River, Bilk Creek and Naturita Creek, that could result from soil disturbances and increased erosion.

Soil disturbances could also contribute slope instability along areas with steep slopes and sensitive soil characteristics.

Best Management Practices would be used on federal lands to avoid or minimize these types of effects to the greatest extent possible.

3.4.1 AFFECTED ENVIRONMENT

General topography through the corridor transitions from undulating plateaus of the Paradox Valley to the west, to mountainous terrain of the San Juans to the east. The topography of the corridor reflects this transition with the western half of the project area consisting of mostly low mesas (to 7,000 and 8,000 feet amsl), capped by resistant sedimentary rocks, dissected by numerous, mostly north-south trending canyons. The larger canyons contain perennial streams, while the smaller canyons have intermittent flows. The eastern half of the project area consists of higher mesas (to 9,500 feet amsl), deep canyons and more mountainous terrain as it approaches the intrusive San Juan mountain range. Elevations through the corridor range from approximately 5,600 feet amsl at the Nucla Substation to 9,800 feet amsl where it crosses mesa tops before dropping to the Sunshine Substation. Slopes range from nearly flat in areas on top of the mesas to extremely steep in bluffs along canyon walls.

Soils in the project area consist mainly of residuum from weathering of parent bedrock material with colluvium along and below steep slopes and alluvium at the toes of slopes, on alluvial fans and along drainageways. The General Soils Map for San Miguel Survey Area, including parts of Montrose, San Miguel and Dolores counties (Soil Conservation Service (SCS) 1977), defines three general soil groups in the project area: Soils of the Mesas, Soils of the Canyons, and Soils of the Mountains. These general soils groups are shown in ***Plate SOILS-1*** and the general characteristics are given in *Table 3.4-1*.

In the northwest part of the study, from Nucla to Specie Creek, the soils fall within the classifications for "Soils of the Mesas." The deeper canyons in this section of the project area are shown as "Soils of the Canyons." Toward the southeast end of the project area, starting at Specie Creek, the soils are shown as "Soils of the Mountains." While the mapping does not cover the last approximately 3 miles of the easterly end of the project area, this part of the corridor will also fall under "Soils of the Mountains."

More detailed delineation and description of soil types was obtained from review of unpublished soil survey information for the San Miguel and the Ouray survey, obtained from the Natural Resources Conservation Service (NRCS undated, report in progress). The Ouray survey area begins just east of Diamond Hill and covers the easterly three miles of the study corridor. From the detailed information, hazards associated with the soil type were identified as: contains very steep slopes (over 50 percent), contains steep slopes (30 to 49 percent), high erosion potential, shallow groundwater, shallow bedrock, landslide areas (as defined in soil survey), and rock outcrop. Areas of soils containing steep and very steep slopes are described in the Geology, Paleontology and Minerals Section 3.3, and are shown in ***Plate GEO-3***. Shallow bedrock and landslide areas are also discussed in Section 3.3 and are shown in ***Plate GEO-2***. The soils constraints map, ***Plate SOILS-2***, shows where these other hazards may exist

along the study corridor. ***Plate SOILS-2*** shows high erosion potential is dominant throughout the project area while ***Plate GEO-3*** indicates very steep slopes generally occur around major drainages. Soil types containing steep slopes, between 30 and 49 percent, are also present in areas throughout the corridors and are more apparent in the easterly portions of the project area (see ***Plate GEO-3***). Rock outcrops are generally confined to canyon walls with shallow bedrock present in areas through the project area, primarily on mesa tops and along canyon walls. Soils noted as having shallow groundwater are minimal. The soils noted in the soil survey as having potential for high shrink/swell and poor strength have been shown in ***Plate GEO-2*** and are not included in the soils discussion (see Geology, Paleontology and Minerals, Section 3.3).

Table 3.4-1
General Soils

Classification	General Description	Limitations
Soils of the Mesas	Formed in alluvium, residuum, and eolian material derived dominantly from sandstone, shale and a few areas of igneous rocks.	Depth to bedrock High shrink/swell potential Areas of steep slopes
Soils of the Canyons (more particularly being the “Rock Outcrop-Orthents-Bodot” association)	Formed in residuum and colluvium material derived from sandstone and shale with around 40 percent being rock outcrop of exposed sandstone, found on sloping to very steep mesa edges, on terraces and landslides.	Steepness High shrink/swell potential Boulders Depth to bedrock
Soils of the Mountains	Formed in residuum, alluvium, colluvium, glacial drift and landslide material derived dominantly from sandstone, shale and mixed sources.	Stones Steepness High shrink/swell potential

Source: General Soils Map for San Miguel Survey Area, including parts of Montrose, San Miguel and Dolores counties (Soil Conservation Service (SCS) 1977)

3.4.2 ENVIRONMENTAL CONSEQUENCES

3.4.2.1 ANALYTICAL FRAMEWORK

The primary impact considered for this resource is increased erosion, which is considered a function of the slope, erosion potential of the soil type, depth to groundwater and depth to bedrock. A secondary impact from increased erosion potential is the transport of eroded sediment. Increased erosion and sediment transport may have adverse impacts on water resources and wetland areas and vegetation. These effects are discussed in Section 3.5, Water Resources and Section 3.6, Biological Resources.

Environmental consequences related to soils would be short -term where lands disturbed by construction are revegetated. Potential long-term consequences could result if disturbed areas remain open (not revegetated) such as along access roads. Permanent cut and fill slopes may also be subject to increased erosion until revegetation is established. Soil-related impacts such as slumping and landslide hazards are discussed in Geology, Paleontology and Minerals, Section 3.3. Other soil constraints shown in ***Plate SOILS-2*** include high shrink/swell potential, shallow groundwater and rock outcrops. These constraints would impact construction methods, but would not adversely affect soil erosion or the potential for soil transport.

POTENTIAL TYPES OF IMPACTS

Slope Stability: Impact to slope stability could occur due to construction activity across the slope, removal of vegetation, disturbance immediately above a sensitive slope, vibration due

to construction activity in adjacent areas, cut or fill on the slope to allow placement of roads or structures. Reduced slope stability would increase hazards of erosion. Susceptible areas include steep slopes, areas with shallow bedrock, and soils with high erosion potential.

Increased Runoff: Increased runoff of surface water could occur due to removal of vegetation or due to change in drainage patterns caused by construction activities. Increased runoff would increase hazards of erosion during precipitation events or due to redirected stream and irrigation flows.

Exposure: Exposure of erosion prone soils would occur due to removal of vegetation, removal of protective cover soil, excavation for borrow, stockpiling of soil material, and placement of borrow material. Exposure of soils would increase hazards of erosion due to both wind and water.

Compaction of Soils: Compaction of soils would occur due to construction traffic and maintenance vehicles. Compaction of the upper soil layer could prohibit infiltration of rainfall and retard vegetative growth, which would lead to increased susceptibility to erosion.

Disturbance in Areas of Shallow Groundwater: Disturbance of areas with shallow groundwater could result in muddy construction conditions and increased erosion and sediment transport. These areas are generally associated with natural drainages and wetlands, and impacts could include higher flow velocities and scour within natural channels. As standard construction practices would typically avoid drainage channels and wetland areas, potential impact in areas of shallow groundwater is considered low.

Definition of Soil Impact Levels

High Impact Potential impacts are considered high for any construction crossing areas containing very steep slopes (more than 50 percent) combined with soils having high erosion potential.

Moderate Impact Potential impacts are considered moderate for any construction crossing areas containing steep slopes (30 to 49 percent) combined with soils having high erosion potential.

Low Impact Potential impacts are considered low for any construction crossing soils with high erosion potential outside of areas of very steep slopes and/or for construction in soils with shallow groundwater.

No Identifiable Impact No identifiable impact is assessed where construction occurs outside of areas defined as low to high impact.

Applicable Permits, Standards and Ordinances

The Project would most likely require a National Pollution Discharge Elimination Permit (NPDES) for construction activities disturbing more than 5.0 acres. This federal program is administered by the State of Colorado, Division of Water Quality.

Environmental Protection Measures

The major impact to soils would occur from disturbance during the construction phase, primarily due to access road clearing and construction. No major new roads are proposed, existing roads may be increased to 12 to 14 feet in width where existing roads are inadequate, and minor spur roads may be constructed to pole locations. Overland construction and helicopter construction is proposed for areas with no existing roads and these construction methods would eliminate major clearing and grading activities. Tri-State has committed to implementing a number of Environmental Protection Measures as shown in *Tables 2.2-4 and* 2.2-5 (see Chapter 2). Applicable measures are listed in *Table* 2.2-4 as numbers 1, 3, 5, 23, 25, 26, 27 and 30, and in *Table 2.2-5* as numbers 10, 12 and 25. Many of these measures would reduce or eliminate concerns to the soils, specifically related to potential erosion and sediment

transport. If an NPDES Permit is required, a sediment and erosion control plan would be part of the permit requirements and would further mitigate potential impacts to soil.

3.4.2.2 IMPACTS OF THE PRIMARY TRANSMISSION ALTERNATIVES

Nucla-Norwood Northern Alternative

115 kV Transmission Line Effects

There are very limited areas, less than 1 mile, with potential for high impact along this alignment. This area occurs at Link 1, between mile markers 10 and 11, where the line would traverse a very steep slope with high erosion potential on the north side of Naturita Creek. This location is shown to utilize existing access or overland construction. There are 1.4 miles defined as having potential for moderate impact, 4.4 miles defined as having potential for low impact, and the remainder of the alignment (approximately 10.0 miles) would have no identifiable impact. This alignment would predominantly use existing access or overland construction (15.7 miles). Only a small segment (0.8-mile) would require road widening or spur roads and this segment is in an area with no identifiable impact (see *Table* 3.4-2).

Substation Effects

Site grading at the Norwood Substation would disturb approximately 2.0 acres and would result in cuts up to 10 feet in height and fill slopes up to seven feet in height. The proposed expansion is outside areas of very steep or steep slopes, but does have soils with high erosion potential and has potential for low impact.

69 kV Transmission Line and Distribution System Effects

The removal of the existing distribution line would disturb the same corridor as the proposed 115 kV line, therefore, no additional impact is anticipated over that discussed above.

Nucla-Norwood Central Alternative

115 kV Transmission Line Effects

This alignment has a 1.1-mile segment with potential for high impact. This segment occurs at Link 5, between mile markers 6 and 7, where the alignment would traverse a very steep slope with high erosion potential on the north side of Naturita Creek. This area is shown to utilize existing access or overland construction. There are no areas classified as moderate impact, 9.0 miles with potential for low impact, and the remainder of the alignment (approximately 9.0 miles) would have no identifiable impact. This alignment would require construction of improved access for 12.3 miles, generally through areas of low and no identifiable impact. The remainder of the alignment would utilize existing access or overland construction with helicopter construction at the Naturita Creek drainage (see *Table* 3.4-2).

Substation Effects

The proposed expansion of the Norwood Substation is located in an area of low impact as it is outside areas of very steep and steep slopes, but does have soils with high erosion potential.

69 kV Transmission Line and Distribution System Effects

There are very limited areas (0.7 mile) with potentially high impact along the alignment where the distribution line would be removed. The most noticeable area coincides with the alignment for the new 115 kV line at Link 5, between mile markers 6 and 7, in an area shown to utilize existing access or overland construction. There are 1.3 miles with potential for moderate impact, 2.7 miles with potential for low impact, and the remainder of the alignment (approximately 7.0 miles) would have no identifiable impact. The removal activities would predominantly use existing access or overland construction.

Table 3.4-2
Impacts in the Nucla - Norwood Alternatives
Soils

Impact Characteristic	Northern Alternative	Central Alternative	Southern Alternative
	Miles		
High Impacts:			
Crosses Very Steep Slopes with High Erosion Potential:			
Existing Access and Overland Construction	0.7	1.1	0.0
Improved Access	0.0	0.0	0.4
Helicopter Construction	0.0	0.0	0.2
Moderate Impacts:			
Crosses Steep Slopes with High Erosion Potential :			
Existing Access and Overland Construction	1.4	0.0	0.0
Improved Access	0.0	0.0	0.0
Helicopter Construction	0.0	0.0	0.0
Low Impacts:			
Crosses Soils with High Erosion Potential or Shallow Groundwater:			
Existing Access and Overland Construction	4.4	1.7	1.2
Improved Access	0.0	7.1	8.8
Helicopter Construction	0.0	0.2	0.7
No Impacts:			
	10.0	1.1	7.0

Nucla-Norwood Southern Alternative

115 kV Transmission Line Effects

This alignment has very limited potential for high impact (less than one mile). These areas are generally short, isolated sections. The most noticeable segment occurs at Link 6, mile marker 9.5, at one crossing of Naturita Canyon shown to be constructed by helicopter. There are 10.7 miles with potential for low impact, and the remainder of the alignment (approximately 7.0 miles) would have no identifiable impact. This alignment would predominantly require construction of improved access (15.0 miles), generally through areas of low impact. The remainder of the alignment, nearing Norwood, would utilize existing access or overland construction with helicopter construction required at several drainages west of Norwood including the Naturita Canyon crossing (see *Table 3.4-2*).

Substation Effects

The proposed expansion of the Norwood Substation is located in an area of low impact as it is outside areas of steep slopes, but does have soils with high erosion potential.

69 kV Transmission Line and Distribution System Effects

There are very limited areas (0.7 mile) with potentially high impact along the alignment where the distribution line would be removed. The most noticeable area would traverse a very steep slope with high erosion potential on the north side of Naturita Creek. This area is shown to utilize existing access or overland construction. There are 1.3 miles defined as having potential for moderate impact, approximately 4.4 miles defined as having potential for low impact, and the remainder of the alignment (approximately 10.0 miles) would have no identifiable impact. The removal activities would predominantly use existing access or overland construction.

Norwood-Sunshine Alternative

115 kV Transmission Line Effects

This alignment has the potential for high impacts at drainage crossings over Beaver Creek, Saltado Creek, Fall Creek, Bilk Creek and South Fork. The Beaver Creek crossing is proposed to be constructed by helicopter only. The Saltado Creek crossing is in an area of proposed road widening, Fall Creek and South Fork crossings would utilize helicopter construction or existing limited access, and Bilk Creek is in an area using existing access and overland construction. Total alignment length with potential for high impact is 2.8 miles, with 1.7 of these miles proposed to use helicopter construction, 0.7 mile would use existing and overland access, and 0.4 mile would require improved access. There are 4.3 miles shown as having moderate impact, approximately 15.0 miles with potential for low impact, and the remainder of the alignment (approximately 8.0 miles) would have no identifiable impact (see *Table 3.4-3*).

Substation Effects

The Sunshine Substation would require minor earthwork in an area where no identifiable impact would occur.

69 kV Transmission Line and Distribution System Effects

As the distribution system modifications are primarily in the same corridor as the proposed 115 kV transmission line, no additional impact is anticipated other than that discussed for the 115 kV line under this alternative. The new distribution lines between the Norwood and Oak Hill Substations, which leave the proposed transmission line corridor, are in areas of low potential impact and no identifiable impact.

Norwood-Telluride Alternative

115 kV Transmission Line Effects

This alignment has two drainage crossings, Beaver Creek and Saltado Creek, (Link 13, mile marker 2 and mile marker 10) where potential impact is high. The Beaver Creek crossing is proposed to be constructed by helicopter while the Saltado Creek crossing is in an area of

proposed road widening. The easterly 12.0 miles of this alignment, beginning at Fall Creek, also has numerous areas with potential for high impact. Approximately 4.0 of these 12.0 miles are shown to be constructed by helicopter only, or helicopter with existing limited access (2.0 to 3.0 miles). The remaining areas would utilize existing access or overland construction. There are a total of 9.7 miles with potential for high impact, with 6.2 of these miles proposed to use helicopter construction, 3.1 miles would use existing and overland access, and 0.4 mile would require improved access. There are 2.7 miles shown as moderate impact, approximately 11.8 miles with potential for low impact, and the remainder of the alignment (4.0 miles) would have no identifiable impact (see *Table 3.4-3*).

Table 3.4-3
Impacts in the Norwood-Telluride/Sunshine Alternatives
Soils

Impact Characteristic	Norwood-Sunshine	Norwood-Telluride
	Miles	
High Impacts:		
Crosses Very Steep Slopes with High Erosion Potential:		
Existing Access and Overland Construction	0.7	3.1
Improved Access	0.4	0.4
Helicopter Construction	1.7	6.2
Moderate Impacts:		
Crosses Steep Slopes with High Erosion Potential :		
Existing Access and Overland Construction	3.1	2.0
Improved Access	0.1	0.1
Helicopter Construction	1.1	0.6
Low Impacts:		
Crosses Soils with High Erosion Potential or Shallow Groundwater:		
Existing Access and Overland Construction	12.9	9.8
Improved Access	1.4	1.4
Helicopter Construction	0.7	0.6
No Impacts:		
	6.1	5.2

Substation Effects

The proposed modifications to the Telluride Substation do not require any earthwork activity and no identifiable impact is anticipated.

69 kV Transmission Line and Distribution System Effects

The distribution system modifications impact three drainage crossings, Fall Creek, Bilk Creek and South Fork, where potential impact is high for a total of 1.9 miles. The remaining distribution system modifications would have moderate impacts (2.1 miles), low impacts (4.6 miles) or no identifiable impacts (2.7 miles). The new distribution lines between the Norwood and the Oak Hill Substations, which leave the proposed transmission line corridor, are in areas of low potential impact and no identifiable impact.

3.4.2.3 IMPACTS OF THE SUBALTERNATIVES

115 kV Transmission Line Routing Alternatives

Subalternatives A and E cross areas with potential for high impact. Potential impacts in these areas are due to steep slopes, sensitive soil conditions and proximity of the alignments to waterways (Naturita Creek and the San Miguel River, respectively). Subalternatives B and C, near the Norwood Substation, cross areas of potentially low impact. Subalternative D, near the Oak Hill Substation, crosses areas with no identifiable impact or low impact.

Underground Subalternative

The Underground Subalternative would cross portions of Beaver, Specie, Wilson and Sunshine Mesas that are characterized by soils with high shrink/swell potential, high erosion potential, and shallow groundwater. The effects that the geology and soil conditions would have on the feasibility of undergrounding the line in these areas are discussed in Section 3.3.2.3. Water related issues are discussed in Section 3.5.2.3.

Additional soil issues associated with the Underground Subalternative are the amount of soil excavation and soil disturbance that would occur and how excess soil would be disposed of. As described in Section 2.0, installing an underground cable would require a trench at least 3 feet wide and 5 feet deep. Once the cable is installed, sand and clean backfill would be used to refill the trench. Overall, the amounts of soil excavated for this subalternative would be approximately 15,840 cubic feet per mile. This compares to soil excavation disturbances of approximately 450 square feet per mile for installing single poles (average 12 per mile). Excess soil waste would need to be disposed of in accordance with landowner wishes and/or the requirements of San Miguel County. Soil-related impacts of this subalternative are considered substantially greater than the overhead Norwood-Sunshine Alternative.

Norwood Substation Alternative Site B

Both Sites A and B for the Norwood Substation have the same total size of 2.0 acres. Site B has less earthwork activity with reduced cut and fill heights, which would result in less impact. Site B is located in an area of very steep slopes with high erosion potential. Potential impacts are assessed as low.

3.4.2.4 CUMULATIVE EFFECTS

Other land-disturbing activities, that cross areas identified as sensitive (see definition of impact), may produce cumulative impacts if they are performed concurrent with this Project or prior to reestablishment of vegetative cover or other permanent erosion control measures. Where timber sales, timber burns or large areas of land clearing for subdivision development are proposed within areas identified by the Project as having potential for moderate to high impact, project mitigation measures may not be effective due to commutative impacts and potential impact would be increased.

3.4.2.5 POTENTIAL MITIGATION MEASURES AND RESIDUAL EFFECTS

In addition to the standard mitigation measures described in *Table 2.2-4* and *Table 2.2-5*, the following supplemental methods that may be employed to mitigate soil impacts are:

1. Limit disturbance in areas with potentially high impact by use of helicopter construction as outlined in the project description, limiting disturbance to 0.13 acres per structure site. The majority of potentially high impact areas have already been identified as using helicopter construction.

2. Limit disturbance in areas with moderate impact by use of existing roads and overland construction as outlined in the project description, eliminating new road construction. The majority of potentially moderate impact areas have already been identified as using overland construction.
3. Use erosion control blankets on disturbed slopes over 30 percent to supplement standard erosion controls and revegetation practices.
4. Span areas containing steep or very steep slopes with high erosion potential.
5. Abandon and reclaim spur roads and overland trails developed for construction to prevent ongoing use by public.
6. Implement an erosion control inspection and maintenance program until such time that permanent erosion control measures are attained.
7. Use helicopter methods to perform long-term inspection and maintenance operations in areas of potentially high impact.

Use of these standard practices and additional methods would reduce potentially high and moderate impacts during construction to residual low and no identifiable impacts by limiting the impact to confined areas which would readily be controlled and remediated. By implementation of these measures, which would permanently reclaim and stabilize disturbed areas, long-term impacts are anticipated to be low to no identifiable impact unless reconstruction is required. If reconstruction is required, the mitigation proposed herein should again be implemented to reduce impacts.

Additional measures for disposing of excess soil waste should be considered by San Miguel County through the Special Use Permit Processing, if the undergrounding subalternative is considered on private lands of Specie, Wilson, or Sunshine Mesas.

3.4.2.6 IMPACTS OF THE GENERATION ALTERNATIVES

Soils impacts from a generator alternative would entail the potential for increased erosion and soil transport: at a generator site; in areas disturbed for a pipeline to connect to the existing natural gas pipeline; and in areas disturbed for the transmission, distribution and substation modifications.

Soil impacts associated with the transmission and distribution modifications would be the same as described above for the Nucla-Norwood Alternatives. Depending on the generator scenario, soil impacts would also occur as described above for the Norwood-Sunshine Alternative.

Additional soil issues associated with the viable generator sites include the potential for increased soil erosion from site excavation and cut and fill slopes. Soil disturbances would also have the potential to increase sedimentation in the San Miguel River and South Fork of the San Miguel River, since the identified viable sites all lie within 0.1 to 0.2 mile of the river(s). Depending upon the site that is developed, a generator alternative could also require a pipeline crossing of the San Miguel River to interconnect with the existing natural gas pipeline. If, in the future, a generation alternative is proposed on federal lands, soil disturbances and potential for sedimentation in the river would need to be studied further.

3.4.2.7 NO ACTION ALTERNATIVE

The No-Action Alternative would not require any new construction but may require increased use of current roadways for maintenance purposes and reconstruction of existing structures on an "as-needed" basis. Emergency repairs may be required that could have potentially high impacts due to weather and site specific conditions and due to the urgency of the task which may not allow for implementation of appropriate mitigation measures.

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3.5 WATER RESOURCES

ISSUES: Protection of wetlands and water quality for the San Miguel River and its tributaries was raised as an issue during scoping.

Project construction activities would disturb soils and potentially increase sedimentation in water bodies. Potential accidents resulting from the operation of construction equipment and vehicles near wetlands and water bodies and drainages may also pose risks to water quality.

Impacts to water resources and water quality can be avoided or substantially minimized through project design, use of Best Management Practices or other mitigation measure requirements at the federal state and local levels.

3.5.1 AFFECTED ENVIRONMENT

The project area is located in the San Miguel River basin, which is a tributary of the Dolores River in the Upper Colorado River basin. The San Miguel River is generally located 3.0 to 5.0 miles northeast of the project area from Nucla to Fall Creek. From Fall Creek to the Telluride Substation a branch of the project area parallels and crosses the San Miguel River. The project area also crosses several small intermittent and perennial tributaries. Annual precipitation in the basin ranges from 23 inches in the high mountain regions around Telluride to 15 inches near Norwood, which is on the edge of the Uncompahgre Plateau, and 13 inches annually below Nucla, where the red sandstone canyons country begins (Owenby et al. 1992, and Colorado Climate Center 1998). High flows occur in the drainages during the months of April and May in the lower elevations, and May and June in the higher elevations. In an average year, the intermittent streams will have water flowing in them during April and May but will be dry by mid-June. Most of the intermittent streams are located in the lower elevations between Specie Mesa and Nucla. Afternoon thunderstorms occur during the summer and will occasionally cause flash-flooding in many of the drainages. *Plate WATER-1* shows the location of water resources in the project area.

IRRIGATION WATERS

Man-made surface water structures, ditches, ponds and reservoirs, are prominent in the project area especially in the lower elevations where farming is still the main livelihood. The major storage reservoirs in the basin are the Gurley and Cone reservoirs to the south of the project area. There are numerous small stock and irrigation ponds and springs throughout the project area. The major irrigation ditches within the project area include the Gurley Ditch between Nucla and Norwood, the Hughes Ditch on Specie Mesa, and the Pleasant Valley Ditch on Wilson Mesa. All ditches and laterals have prescriptive easements for access and maintenance.

WELLS

The Town of Norwood uses groundwater for the town water supply. Other permitted wells, which are usually located near homes and clustered around the communities of Norwood, Redvale and Nucla and scattered throughout the project area, are used for domestic and irrigation water supplies. Groundwater is hard but considered good for domestic and stock use. Groundwater near mining areas has sometimes been contaminated with heavy metals from tailings ponds (Colorado Department of Health (CDOH 1996)).

SURFACE WATER QUALITY

The overall surface water quality in the project area, as rated by the United States Environmental Protection Agency (EPA) in the Index of Watershed Indicators, is Better Water

Quality with low vulnerability to stressors such as pollutant loading, hydrologic modifications, and urban and agricultural runoff (EPA 1998). As a source for drinking water the drainage is rated as "no significant impairment" identified with 80-100 percent of assessed rivers and lakes meeting drinking water designated uses (EPA 1998). Ambient groundwater and surface water samples with chemical levels exceeding one-half of the drinking water standard are five percent or less (EPA 1998).

FLOODPLAINS

There is a limited amount of information about the floodplains for the drainages within the project area. The Federal Emergency Management Agency (FEMA) has mapped the estimated 100-year floodplains for the San Miguel River and three major tributaries, Fall Creek, Beaver Creek, and Naturita Creek. The 100-year floodplain is shown at approximately 250 feet in width for the tributaries except for Beaver Creek, which is shown at approximately 250 feet to 500 feet in width. Natural floodplains of unmapped drainages are narrow valley terrain found at the bottom of canyons.

WETLANDS

The wetlands in the project area are generally associated with riparian wetlands occurring along the creeks and around water bodies, as well as those developed from irrigated agricultural land in the lower elevations. The U. S. Fish and Wildlife Service (USFWS) has produced draft maps that show wetlands based on review of aerial photography (USFWS 1994 and 1998). These maps were used as a preliminary indicator for wetlands located within the project area and were supplemented by review of vegetation and aerial maps (project aerial photography and vegetation maps supplied by Geo/Graphics and KEA Environmental, Inc.), review of soil information (NRCS Survey, see Soils, Section 3.4), and through field reconnaissance of accessible areas. The types of wetlands primarily identified within the project area (USFWS) were emergent, aquatic bed and scrub-shrub palustrine wetlands in the flatter areas on mesa tops, and upper perennial wetlands along creeks and drainages. Typical vegetation found in the wetlands include willow, mountain alder, and a variety of grasses and sedges. In the lower elevations cattails and willows are the predominant wetland species (see Biological Resources, Section 3.6). The wetlands found throughout the project area are generally isolated pockets caused by localized conditions or linear wetlands associated with drainage paths. These wetlands can change seasonally due to climatic and irrigation changes and all corridors should be reviewed prior to construction.

FEDERAL MANAGEMENT

There are no designated Wild and Scenic Rivers in the project area. The Bureau of Land Management has designated Beaver Creek as an Area of Critical Environmental Concern, within the San Miguel Special Recreation Management Area. The BLM has also designated areas for Aquatic and Riparian Management on Beaver Creek, Naturita Creek, and a tributary of Specie Creek. See Land Use, Section 3.8.

3.5.2 ENVIRONMENTAL CONSEQUENCES

3.5.2.1 ANALYTICAL FRAMEWORK

POTENTIAL TYPES OF IMPACTS

The types of project activities that could potentially cause adverse impacts to surface water bodies, floodplains, groundwater, and wetlands include construction at pole locations, access roads, and staging/storage areas; activities at wire handling areas and marshaling yards; topping and/or clearing of vegetation in the right-of-way, and maintenance of the right-of-

way such as cutting or removal of vegetation every four to six years to maintain electric clearances. The primary types of adverse impacts that could occur to the water resources in the project area include:

- Impaired surface water quality due to increased erosion and sedimentation from exposed, disturbed ground
- Reduced capacity of natural drainages at road crossings
- Impaired surface water quality or physical resource damage due to inadvertent placement of fill directly into waterways or wetlands from the construction of road crossings or pole placement
- Physical damage to well casings
- Physical damage to irrigation ditch structures and easements
- Physical damage to wetland vegetation
- Altering drainage patterns causing either drainage or flooding of existing wetlands
- Altering the wetland area causing a deterioration in its function or value
- Altering the floodplain causing a deterioration in its function or value
- Impaired surface or groundwater quality due to spillage or inappropriate disposal of construction materials or vehicle fluids.
- Impaired groundwater quality due to disturbance in and around wells.

Definition of Water Resource Impact Levels

The criteria used in assessing Project-related impacts to water quality and resources are based on proximity of construction to water resources and are as follows:

High Impacts: Potential impacts are considered high for segments where the alternative alignment crosses:

- Major drainages with associated riparian and/or floodplain values
- Major drainages in areas of proposed new road construction
- Major water bodies with associated riparian values
- Extensive, contiguous wetlands

Moderate Impacts: Potential impacts are considered moderate where the alternative alignment:

- Crosses smaller, noncontiguous wetlands, or has adjacent wetlands
- Crosses major drainages
- Crosses minor drainages with associated riparian and/or floodplain values
- Crosses minor drainages in areas of proposed new road construction
- Crosses small water bodies

Low Impacts: Potential impacts are considered low where the alternative alignment:

- Crosses or is within 250 feet of an irrigation ditch
- Crosses or is within 250 feet of a well
- Crosses minor drainages

No Identifiable Impacts: No identifiable impacts would result where the construction, operation, or maintenance of the Project is outside of the areas described for low to high impacts.

Applicable Permits, Standards and Ordinances

It is anticipated that federal and county permits for project construction would be required. The federal permits that may be required to mitigate construction impacts are:

- U.S. Army Corps of Engineers (ACOE) Section 404 individual permit and/or U.S. Army Corps of Engineers (ACOE) Section 404 Nationwide Permit

- National Pollutant Discharge Elimination System (NPDES) Permit for construction
- San Miguel County Special Use Permit for Wetland Mitigation
- Groundwater discharge permit for dewatering during construction

Environmental Protection Measures

In order to minimize project construction and operation effects, Tri-State has committed to implementing a number of Environmental Protection Measures (EPM) listed in *Tables 2.2-4* and 2.2-5. These measures would be implemented for any of the action alternatives selected. Mitigation measures pertaining to water resource issues are items 8 through 11, 20 through 22, 28, 32, and 35 through 39 in *Table 2.2-4* for private and public lands, and items 2 through 8, 16, and 19 in *Table 2.2-5* for public lands. Among others, EPMs would require the spanning of streams, water bodies and sensitive riparian areas. Pole spans average 450 feet for single poles and over 800 feet for H-frame and 3-pole structures, thereby allowing sensitive water resources to be avoided in most instances.

3.5.2.2 IMPACTS OF THE PRIMARY TRANSMISSION ALTERNATIVES

The impact analysis focuses on wetland areas, major and minor drainages, floodplains, water bodies, and manmade water structures as described in Section 3.5.1, Affected Environment. project activities should not have any significant impact to groundwater resources or floodplains. Groundwater would not be impacted because water tables are located in formations below any area of construction. If transmission structures are placed in a floodplain area, they would be constructed to withstand flood flows, and any loss of flood storage capacity would be compensated in accordance with local floodplain development regulations and standard mitigation measures described in *Table 2.2-4*. *Tables 3.5-1* and *3.5-2* summarize the high, moderate and low impacts for each alternative.

Nucla-Norwood Northern Alternative

115 kV Transmission Line Effects

This alternative would be located along Link 1 and Link 2 between the Nucla Substation and the Norwood Substation. Potentially high impacts could result on Link 1 between mile markers 3.3 and 3.8, where numerous contiguous wetland areas are crossed. Impacts would be high if these wetlands could not be spanned and would result in damage to the wetland vegetation and/or deterioration in the wetland value and function. Other potentially high impacts could occur where the alignment crosses a tributary to Naturita Creek with riparian values (Link 1, mile 1.5). There is a short piece of this alignment that requires improved access where impact may be high at the crossing of McKee Draw (Link 2, mile marker 0.8).

Potential for moderate impacts occurs with numerous small wetland areas adjacent to the alignment between Nucla and Redvale (Link 1 between mile markers 2 and 8) and west of Norwood (Link 2, between mile markers 0 and 4). There are also eight major drainages tributary to Naturita Creek which would be crossed by the alignment where potentially moderate impacts could occur due to general construction activities and a water body at Link 1, mile marker 6.5. These are in areas utilizing existing roads or overland construction methods.

Potential for low impacts could occur where the transmission line construction is within 250 feet of an irrigation ditch in four locations, within 250 feet of six wells (Redvale and Norwood areas), and crosses two minor drainages.

Table 3.5-1
Impacts in the Nucla - Norwood Alternatives

Impact Characteristic	Northern Alternative	Central Alternative	Southern Alternative
High Impacts:			
Alignment Crosses:			
Major Contiguous Wetland Areas	1	0	0
Major Water Bodies	0	0	0
Major Drainage in areas requiring improved access	1	2	3
Major Streams with Riparian & Floodplain values or in construction area	1	7	6
Moderate Impacts:			
Alignment Crosses:			
Small and Adjacent Wetlands*	39	14	8
Major Drainages	8	14	12
Minor Drainages with Riparian values	0	1	0
Minor Drainages in road construction area	0	2	5
Water Bodies	1	0	0
Low Impacts:			
Alignment Crosses:			
Irrigation Ditches*	4	2	1
Wells*	6	0	2
Minor Drainages	2	4	8

**Within 250 ft. of Alignment*

Table 3.5-2
Impacts in the Norwood-Telluride and Norwood-Sunshine Alternatives

Impact Characteristic	Norwood-Sunshine	Norwood-Telluride
High Impacts: ‡		
Alignment Crosses:		
Major Contiguous Wetlands	1	1
Major Water Bodies	0	0
Perennial Streams with Riparian & Floodplain values	5	8
Perennial and Major Drainages in Road Construction area	1	1
Moderate Impacts:		
Alignment Crosses:		
Small and Adjacent Wetlands*	32	23
Major Drainages	13	14
Minor Drainages with Riparian values	2	1
Minor Drainages in Road Construction area	1	1
Water Bodies	0	0
Low Impacts:		
Alignment Crosses:		
Irrigation Ditches*	4, crosses 1 twice	3, crosses 1 twice
Wells*	10	5
Minor Drainages	9	9

‡ *In most cases, potential high impacts to perennial riparian streams with floodplain values would be minimized by spanning and careful pole placement.*

* *Within 250 ft. of Alignment*

Substation Effects

Expansion of the Norwood Substation, Site A, would occur in an area with no streams or wetlands. There are several domestic wells in the area of the substation and the expansion of the substation would extend within the area of the well locations but should avoid the actual well structure, and impacts are anticipated to be low. The expansion of the substation would also expand into the easement of the South Lateral Ditch. It is anticipated that impacts would be low to no identifiable impact for the expansion of the Norwood Substation.

69 kV Transmission Line and Distribution System Effects

As the modifications and removal of the existing 69 kV transmission line are in the same corridor as the 115 kV line no additional impacts are anticipated other than those described for the construction of the 115 kV transmission line under the Northern Alternative.

Nucla-Norwood Central Alternative

115 kV Transmission Line Effects

This alternative would locate the 115 kV line along Link 2, Link 4 and Link 5. Upgrading of existing roads or building spur roads to pole sites would occur in a part of Link 2, all of Link 4 and part of Link 5 for a total of 12.3 miles.

In areas with required road improvements, high impacts may occur at seven unnamed tributaries to Naturita Creek where the alignment crosses these tributaries. The alignment also crosses a major drainage with riparian values in two places. Both of these crossings occur in Naturita Canyon, the first in Link 4 at mile marker 1, and the second crossing is in Link 5 near mile marker 5.

Potentially moderate impacts could occur where the alignments cross 14 major drainages and one minor drainage with riparian values, all of which are tributaries of Naturita Creek. Other potentially moderate impacts may occur where the alignment crosses two minor drainages in an area requiring improved road construction, and where numerous (14) small wetlands are crossed or adjacent to the alignment.

The remainder of the alignment is classified as having potentially low to no identifiable impacts.

Substation Effects

Impacts of expanding the Norwood Substation at Site A would be the same as described previously for the Nucla-Norwood Northern Alternative.

69 kV Transmission Line and Distribution System Effects

It is anticipated that removal of the existing 69 kV transmission line along the Nucla-Norwood Northern Alternative, from the Nucla Substation to the transition point between Link 1 and Link 2, approximately 3.5 miles north and west of the Norwood Substation, would result in similar impacts as reported for construction of the 115 kV transmission line of the Nucla-Norwood Northern Alternative. Potential for high impacts occurs at contiguous wetland crossings (Link 1, mile markers 3.3 to 3.8) and at one major drainage with associated riparian and floodplain values. Moderate impact may occur where numerous small wetlands are crossed or immediately adjacent to the corridor and at crossings of three major drainages without associated values.

Nucla-Norwood Southern Alternative

115 kV Transmission Line Effects

This alternative would route the 115 kV transmission line along Link 4, from the Nucla Substation south 6.0 miles, then due east 2.0 miles into Link 6 and Link 7, which takes a southeasterly direction until the route terminates at the Norwood Substation. Upgrading of existing roads and construction of spur roads to pole sites along all of Link 4 and most of Link 6 have potential for causing water quality impacts from sedimentation caused by road construction and powerline construction.

Potential for high impacts occurs where the alignment crosses a major drainage with riparian or floodplain values in three places, and six major drainages would be crossed in areas requiring improved road construction.

Moderate impact is anticipated where the alignment crosses 12 major tributaries of Naturita Creek and five minor drainages in areas requiring improved road access, and two small wetland areas (Norwood area).

Potentially low impacts could occur along Link 7, which is due west of the Norwood Substation, where the alignment crosses or is adjacent to the Cone Ditch, a minor drainage, and where there are eight domestic wells adjacent to the alignment. Low impact may also occur where the alignment crosses eight minor drainages where no road improvements are proposed.

Substation Effects

Impacts from expanding the Norwood Substation at Site A would be the same as previously discussed for the Nucla-Norwood Northern Alternative.

69 kV Transmission Line and Distribution System Effects

It is anticipated that dismantling and removing the existing 69 kV transmission line along the Nucla-Norwood Northern Alternative, Link 1 and Link 2, may result in the same types and degrees of impact as reported for the construction of the 115 kV transmission line in the Nucla-Norwood Northern Alternative. Potential for high impacts occurs at contiguous wetland crossings (Link 1, mile markers 3.3 to 3.8) and at one major drainage with associated riparian and floodplain values. Moderate impact may occur where numerous small wetlands are crossed or immediately adjacent to the corridor and at crossings of eight major drainages without associated values.

Norwood-Sunshine Alternative

115 kV Transmission Line Effects

The alternative is located along Links 11, 12, 13, 14 and 15, which runs in a southeasterly direction from the Norwood Substation, connecting at the Oak Hill Substation, the Specie Mesa Substation, the Wilson Mesa Substation and ending at the Sunshine Substation. Potentially high impacts could occur from sedimentation and affect the water quality of waterways and riparian zones as a result of transmission line construction, and could impact wetlands vegetation and/or function and value where the transmission line crosses the wetlands.

The alignment crosses one major wetland area, a large riparian wetland approximately 1.0 mile north and west of the Sunshine Substation in Link 15, at mile markers 6 and 7. Potentially high impacts may also occur at crossings of five major drainages with associated riparian or floodplain values. These drainages cross from south to north at intervals along the alignment and include Fall Creek (Link 14, mile marker 1), a tributary on Beaver Mesa (Link 13, mile marker 5), Beaver Canyon and Gurley Canyon (Link 13 between mile markers 1 and 2). Potentially high impact also occurs at a major drainage crossing in an area requiring improved road access (Saltado Creek).

Moderate impacts have also been identified at crossings of 13 unnamed major drainages, two minor unnamed drainages with riparian values, and one minor drainage crossing in an area requiring improved road access. Moderate impact may also occur at 32 places where the alignment crosses or is within 250 feet of small, scattered wetland areas (primarily on Wilson Mesa).

Potentially low impacts occur where the alignment of the new transmission line crosses or is adjacent to four irrigation ditches on mesa areas, 10 wells in and around Norwood and on Wilson Mesa, and where nine minor drainages are crossed.

Substation Effects

Enlarging the Sunshine Substation would have potentially low impacts on water resources in the area. Access roads exist, one that is a paved highway that is located between the substation and the South Fork of the San Miguel River. The substation is located 750 feet away from the South Fork of the San Miguel River. No other water resources are noted in the area.

Other impacts to wetlands associated with dismantling the Oak Hill Substation and making minor modifications to the Specie Mesa and Wilson Mesa Substations would be the same as described for the Norwood-Telluride Alternative described below.

69 kV Transmission Line and Distribution System Effects

Impacts to water resources for rebuilding the 69 kV transmission line as a 115 kV transmission line would be the same as described above for the 115 kV transmission line. Impacts to water resources associated with underbuilding the distribution on the 115 kV transmission line poles would also be the same as previously described for the transmission facility.

Other distribution system modifications would have high to moderate impacts on water resources. These changes include high impacts for undergrounding the distribution system for approximately 0.5-mile from the Sunshine Substation, and crossing the South Fork Road and the South Fork of the San Miguel River through a wetland and riparian area. Other high impacts would include constructing the new distribution west and north of the Oak Hill Substation. Potentially high impacts could result from construction in wetland or riparian areas, located on Link 15, between mile markers 6 and 7. The new three-phase overhead distribution lines between the Norwood and Oak Hill Substations could cause moderate impacts to minor drainages.

Norwood-Telluride Alternative

115 kV Transmission Line Effects

The 115 kV transmission line would be located along Links 11, 12, 13, 19, 20, 21 and 22 which runs in a southeasterly direction from the Norwood Substation, connecting at the Oak Hill Substation, the Specie Mesa Substation and ending at the Telluride Substation. High and

moderate impacts could result where the transmission line construction and road improvements would occur in wetland or riparian areas or where the transmission line would cross riparian wetlands.

Potentially high impacts are identified for a major wetland area at the confluence of the South Fork and the San Miguel River (Link 21, mile markers 0 to 1.0). Potentially high impacts could also occur at crossings of eight major drainages with riparian or floodplain values. These drainages run south to north across the alignment and the most predominant include Fall Creek, Bear Creek, Gurley Canyon and Beaver Canyon. Potentially high impacts could occur at one other major drainage where improved access is required.

Potentially moderate impacts would occur at 23 places where the alignment crosses or is adjacent to small, scattered wetlands, at crossings of 14 major drainages, at one minor drainage with riparian values, and at one minor drainage where improved access is required.

Low impacts could occur where the new transmission line crosses irrigation ditches in three locations, crossing one in two locations on Specie Mesa near the substation. Low impacts could occur at crossings of nine minor drainages and where five wells are adjacent to the alignment.

Substation Effects

Oak Hill Substation: The Oak Hill Substation would be dismantled. The potential impacts to the water resources in the area are estimated to be low, since there are no drainages or wetlands in the substation area.

Specie Mesa Substation: Modifications to the Specie Mesa Substation would cause no impacts to water resources. The substation is approximately 200 feet from a road with no water resources in the area.

Telluride Substation: Impacts from modifying the Telluride Substation are considered potentially moderate due to the substation location adjacent to riparian wetlands on Link 21. The substation expansion would not require any grading, however construction crews and equipment would be located 100 feet from the San Miguel River and riparian wetlands.

69 kV Transmission Line and Distribution System Effects

The existing 69 kV transmission line would be rebuilt as the 115 kV line from the Norwood Substation, south and east to the Oak Hill Substation, the Specie Mesa Substation, and ending west of Fall Creek (Links 11, 12 and 13 from mile markers 0 to 11). Along this section, impacts associated with rebuilding the 69 kV line are the same as reported above for the 115 kV line.

Other modifications to the 69 kV transmission line that would occur with this alternative include converting the line to an overhead distribution system along Link 14 from mile marker 0 to mile marker 2, and undergrounding the distribution line from Link 14, mile marker 2, to the Wilson Mesa Substation. The remainder of the present 69 kV transmission line would be removed from the Wilson Mesa Substation to the Sunshine Substation.

Between Link 14, mile marker 0 and 2, the 69 kV line would be converted to an overhead line. Potential impacts to water resources are considered high where the line would cross the Fall Creek drainage and low where the distribution line crosses a minor drainage 1.0 mile north and west of Fall Creek. In Link 14, from mile marker 2 to the Wilson Mesa Substation, the 69 kV line would be removed and a distribution line would be installed underground. There are no water resources along this stretch, therefore, impacts are considered low to none.

Between the Wilson Mesa Substation and the Sunshine Substation impacts to water resources resulting from the 69 kV line removal would range from low to potentially high. A large riparian wetland exists on Link 15, between mile markers 6 and 7, which runs approximately

0.5-mile northwest of the Sunshine Substation. Impacts to the wetlands at this location are potentially high. Smaller wetland areas exist in Link 15, between mile markers 3 and 4, located approximately 3.5 miles northwest of the Sunshine Substation, and between mile markers 0 and 1, located approximately 0.5 mile east of the Wilson Mesa Substation, where moderate impacts could occur from removal of the line. Potentially moderate impacts could occur in Link 15 to Bear Creek and its tributaries, between mile markers 1 and 3, and to Bilk Creek between mile markers 5 and 6. Potentially low impacts may occur where the 69 kV line currently crosses the Pleasant Valley Ditch in Link 15, between mile markers 0 and 1, and to five domestic wells located on Link 15, between mile markers 2 and 4, on Wilson Mesa.

Modification of the 69 kV line would also entail undergrounding the existing distribution line along Link 21, mile marker 1, between Ilium Valley and the Telluride Substation. The modification would entail burying the distribution line and could cause potentially high impacts to the riparian wetland located along Link 21, from mile marker 1 to the Telluride Substation. The new three-phase overhead distribution lines between the Norwood and Oak Hill Substations could cause moderate impacts to minor drainages.

3.5.2.3 IMPACTS OF THE SUBALTERNATIVES

115 kV Transmission Line Routing Alternatives

Subalternative A: Subalternative A would replace spanning Naturita Canyon (Link 6, between mile marker 9 and 10) with poles constructed in the canyon. Impacts for this subalternative could be high since Naturita Creek is a major drainage with riparian values; however, since no new roads would be built, the impacts could be reduced to moderate levels with mitigation.

Subalternative B: Subalternative B, located near the Norwood Substation, would route the transmission line around existing wells and a major drainage and would route the line along the Cone Ditch. Impacts to water resources are estimated to be low for this alternative.

Subalternative C: Subalternative C would route the 115 kV transmission line south of existing wells around the Norwood Substation and would cross a major drainage. Impacts to the existing wells are estimated to be low and impacts to the drainage are potentially moderate.

Subalternative D: Subalternative D, which would route the 115 kV transmission line around a wetland area, would result in potentially moderate impacts since the wetland is adjacent to the subalternative route.

Subalternative E: Subalternative E would route the Norwood-Telluride 115 kV transmission line to the south side of the San Miguel River. This subalternative route is located on private land and would be located approximately 50 feet to 250 feet from the river, and would cross the river twice. Due to the proximity of the line to the river and wetlands, impacts are considered potentially high along Link 22, which is approximately 1.0 mile in length. The proposed construction method is helicopter, which would mitigate potentially high impacts to moderate levels.

Underground Subalternative

The Underground Subalternative to portions of the Norwood-Sunshine Alternative would have the potential to directly impact a number of drainages and wetland areas. Potential impacts to water resources and wetlands would be high in these types of environments. Across Beaver Mesa, the underground trench would have potential direct impacts to Wolf Gulch (at 3 crossings), to a drainage associated with Huff Gulch (at one crossing) and to a tributary to Beaver Canyon (at 3 crossings and where the trench would be parallel to the tributary for 1.0 mile). Across Specie Mesa, several drainages would be crossed. This segment of the underground alignment crosses an irrigation ditch; the Specie Creek drainage, that is 80 feet deep and 400 feet wide and supports a narrow band of riparian vegetation; the Hughes Ditch (twice), and a shallow, wet drainage swale.

Across Wilson Mesa, the Underground Subalternative to the Norwood-Sunshine line would also directly impact a number of water resource areas, including an irrigation ditch, two areas characterized as wet or marshy, two tributary drainages to Muddy Creek, a drainage of Bilk Creek and areas characterized by shallow groundwater and riparian wetland vegetation. Across Sunshine Mesa, one wet meadow wetland is within 150 feet of the existing line.

Norwood Substation Alternative Site B

Building the Norwood Substation Alternative Site B would entail undergrounding a line that would cross a minor drainage with no riparian values and an irrigation ditch. Potential impacts to a new Norwood Substation Site B are estimated to be low.

3.5.2.4 CUMULATIVE EFFECTS

Other land-disturbing activities that cross areas identified as sensitive (see definition of impact), may produce cumulative impacts if they are performed concurrent with this project or prior to reestablishment of vegetative cover or other permanent erosion control measures. Where timber sales, timber burns or large areas of land clearing for subdivision development are proposed within areas identified by the Project as having potential for moderate to high impact, project mitigation measures may not be effective due to cumulative impacts, and potential impact would be increased. Where additional projects cross water resource areas identified by the Project, cumulative impacts may be realized due to multiple crossings of a stream, dry wash or other water resource area.

3.5.2.5 POTENTIAL MITIGATION MEASURES AND RESIDUAL EFFECTS

Standard Mitigation Measures described in *Table 2.2-4* have been proposed by Tri-State as minimum construction standards for the selected alternative. *Table 2.2-5* shows additional measures required on Forest Service and BLM lands. Tri-State's standard practices, that would protect water quality and limit damage to water resources by limiting disturbance, controlling erosion, and avoiding water resource areas include numbers 1, 8, 9, 10, 11, 20, 21, 22, 31, 32, 35, 36, 37, 38 and 39.

Agency required measures, listed in *Table 2.2-5,* should be incorporated into the standard practices for the entire alignment to further mitigate potential impact to water quality and water resources. Standard practices should also include measures to avoid or limit disturbance of water resource areas and to control and contain any potential spills from construction.

Additional methods that may also be employed to further mitigate impacts to water quality and water resources are:

1. Limit disturbance in areas with potentially high impact by use of helicopter construction as outlined in the project description, limiting disturbance to 0.13 acre per structure site. The majority of potentially high impact areas have already been identified as using helicopter construction.
2. Limit disturbance in areas with moderate impact by use of existing roads and overland construction as outlined in the project description, eliminating new road construction. The majority of potentially moderate impact areas have already been identified as using overland construction.
3. Implement an erosion control inspection and maintenance program until such time that permanent erosion control measures are attained.
4. Use helicopter methods to perform long-term inspection and maintenance operations in areas of potentially high impact.

Generally, water resources through the project area are scattered and isolated. Use of these standard practices and additional methods are anticipated to reduce potentially high and

moderate impacts during construction to residual low and no identifiable impact by limiting the impact to a confined area, which would readily be controlled and remediated. The exception would be in areas where water resources cannot be easily spanned or avoided due to size or clustering of the resource areas. In these areas potential impact during construction would remain high and is anticipated to occur at the following locations:

- On the Nucla-Norwood Northern Alternative, Link 1, mile markers 3.3 and 3.8 where contiguous wetlands may be difficult to avoid.
- On the Norwood-Telluride Alternative, at Link 19 (mile 8.3), at Link 20 (mile 0 to 0.2), and Link 21 (mile 0.8 to 1 and mile 2 to 2.3), where the alignment parallels and crosses the San Miguel River with associated wetland, riparian and floodplain values.
- For the entire length of Subalternative E where the alignment is immediately adjacent to the San Miguel River with associated wetland, riparian and floodplain values.
- On the Norwood-Sunshine Alternative, Link 15, mile 6.4 to 7.0, where the alignment crosses and parallels the South Fork of the San Miguel River with associated wetland, riparian and floodplain values.
- On the Underground Subalternative, where water resources could not be avoided. These include intermittent areas along Link 13, between mile markers 5.8 and 6.8, 10.0 and 13.5; Link 15, between mile marker 0.0 and 1.3, and Link 15, between mile marker 2.0 and 5.0. Following the Stock Drive Road would minimize impacts to water resources on Specie Mesa by utilizing areas with existing access roads.

Implementation of the mitigation measures described above would avoid or limit disturbance to water resources and would reclaim and stabilize disturbed areas for the overhead transmission alternatives. Long-term impacts would be low or no identifiable impact in most cases, after mitigation is completed. The exception may be in the areas listed above where avoidance may be difficult and permanent construction in water resource areas may be necessary.

3.5.2.6 IMPACTS OF THE GENERATION ALTERNATIVES

Impacts to water resources that could result from a generator alternative encompass potential effects from developing a generator site within close proximity to the San Miguel River or the South Fork of the San Miguel River; potential disturbances from crossing the San Miguel River with a natural gas pipeline; the impacts previously reported for the Nucla-Norwood Northern Alternative, and, depending upon the generator alternative selected, impacts reported for the Norwood-Sunshine Alternative. Cumulatively, the potential effects of the generator alternative(s) on water resources are considered substantially higher than from the transmission alternatives. Should a generation alternative be proposed in the future on federal lands, additional engineering and environmental studies would be conducted to document project effects and potential mitigation measures.

3.5.2.7 NO ACTION ALTERNATIVE

The No Action Alternative would take place if Tri-State does not upgrade the existing 69 kV line. This would result in San Miguel Power Association (SMPA) independently managing the difficulties currently associated with the aging 69 kV transmission line. SMPA would use the existing roads for heavy maintenance of the aging line. The No Action Alternative would not require any new construction but may require increased use of current roadways for maintenance purposes and reconstruction of existing structures on an "as-needed" basis. Emergency repairs may be required that could have potentially high impacts due to weather and site specific conditions, and due to the urgency of the task, which may not allow for implementation of appropriate mitigation measures.

3.6 BIOLOGICAL RESOURCES

ISSUES: The construction and operation of the Project may directly or indirectly affect wildlife and plant species due to ground disturbances, the construction of the Project during breeding periods, or locating poles and conductors in suitable habitat of special status or sensitive species.

Issues raised during scoping include potential impacts to old growth forests and habitat fragmentation, to wetlands, and to special status species such as the Gunnison sage grouse and the American Bald Eagle.

Biological resources discussed in this section include vegetation communities and associated wildlife, sensitive habitat's and special status species. Reference should be made to Appendix B for additional information on methodology and GIS databases used for this analysis.

3.6.1 AFFECTED ENVIRONMENT

DESCRIPTION OF VEGETATION COMMUNITIES AND ASSOCIATED WILDLIFE

The San Miguel River Watershed centers on the town of Nucla and covers an elevation range of 5,000 to greater than 14,000 feet. The valley floor is predominantly agriculture, changing to deciduous woodlands in the foothills, then spruce-fir-aspen forests at the higher elevations. Using the classification system of the Southwest Colorado Interagency Vegetation Classification Project (based on Anderson *et al* 1976), a total of 27 coverage types were mapped throughout the Project alternative corridors for the Nucla-Telluride Transmission Line Project (*Table 3.6-1* and ***Plate BIO-1**, Vegetation Communities*). These include 24 natural communities that may generally be categorized as rangelands, woodlands, forest lands, and riparian. These natural communities cover approximately 21,781.66 acres, or 85 percent of the area within the Project alternative corridors. In addition, three other land covers were mapped within the project area: rock, urban-built up and agriculture.

RANGELAND

Vegetation Types. Three types of rangeland were mapped within the Project alternative corridors, a grass and forb mix, a sagebrush dominated rangeland, and a sagebrush and grass mix. Rangelands comprise 31 percent of the natural vegetation communities within the Project corridors.

Grass and forb rangelands include perennial and annual grasslands. Grasslands that occur at low elevations (less than 6,000 feet) may be dominated by species such as blue grama, needle and thread, dropseed and several species of brome. Mid-elevation (between 6,500 and 9,500 feet) grasslands are dominated by western wheatgrass, blue grama, smooth brome, cheatgrass, and clover. The perennial grasses and forbs must build most of their aboveground tissues during a narrow window of favorable conditions in the late spring and early summer. Cheatgrass, an exotic annual, has greatly altered the species composition of rangelands. Lower elevation shrub rangelands may be dominated by big sagebrush. In particular, sagebrush parkland is dominated by big sagebrush with snakeweed and rabbitbrush. Where sagebrush and perennial grasses co-dominate, the vegetation type is a sagebrush-grass mix. Generally the shrubs within this community have a regular arrangement with grasses and forbs occurring seasonally between the shrubs. The dominant shrub species include big sagebrush and black sage. Dominant grass species include crested wheatgrass and blue grama.

Wildlife. Grasslands are inhabited by bird species such as horned lark, western meadowlark, common poor-will, vesper sparrow, and Swainson's hawk. Bird species in sagebrush include Brewer's sparrow, sage thrasher, and Brewer's blackbird. Mammals of open country grasslands

and low shrublands include desert and mountain cottontail, prairie dog, American badger, Ord's kangaroo rat, meadow vole, red fox, and coyote. These habitats provide important winter range for elk and mule deer. Common rangeland butterflies are ochre ringlet and checkered white.

Table 3.6-1
Vegetation Communities and Land Cover Types Within the Nucla-Telluride Transmission Line Project Study Corridors

Level I	Level II	Level III	Acreage
Rangeland	Grass/Forb	Grass/Forb Rangeland (GRF)	4254.03
	Shrub	Sagebrush Parkland (SGP)	201.86
	Shrub/Grass/Forb Mix	Sagebrush/Grass Mix (SGG)	2310.41
Woodland	Conifer Woodland	Pinyon-Juniper (PJN)	4650.23
	Deciduous Woodland	Gambel Oak (GOK)	2226.84
		Mountain Shrub Mix (MSX)	45.43
	Mixed Woodland	Pinyon-Juniper/Gambel Oak Mix (PJO)	3.37
		Pinyon-Juniper/Sagebrush Mix (PSX)	1370.01
		Pinyon-Juniper/Mountain Shrub Mix (PMX)	1586.51
Forest Land	Deciduous Forest	Aspen (ASP)	1473.35
		Aspen/Gambel Oak Mix (AOX)	18.89
	Evergreen Forest	Ponderosa Pine (PPO)	3.44
		Englemann Spruce (ESP)	78.14
		Douglas-Fir (DFR)	890.86
		Douglas-Fir/Open Type(DFO)	355.23
		Ponderosa Pine/Douglas-Fir Mix (PDX)	69.52
	Mixed Forest	Spruce/Fir/Aspen Mix (SFA)	34.35
		Ponderosa Pine/Gambel Oak (PPG)	402.03
		Douglas-Fir/Gambel Oak Type (DFG)	489.16
		Douglas-Fir/Aspen Mix (DFA)	682.90
		Douglas-Fir/Aspen/Gambel Oak Type (DAO)	36.61
		Englemann Spruce/Aspen Mix (ESA)	141.49
Riparian		Riparian (RIP)	419.58
		Upland Willow Scrub (UWS)	37.42
Subtotal of the Natural Vegetation Communities =			**21781.66**
Barren Land	Rock	Rock (RCK)	180.20
Urban/ Built Up	Residential & Commercial	Urban/Built Up (URB)	122.42
Agriculture		Agriculture (AGR)	3516.97
Subtotal of Other Land Cover Types =			**3819.59**
Total Area Within the Project Study Corridors =			**25,601.25**

Note: Vegetation cover-type categories are listed in hierarchical form based on the classification system devised by Anderson et al (1976) titled A Land Use and Land Cover Classification System for Use with Remote Sensor Data.

WOODLAND

Vegetation Types. The woodlands that were mapped within the Project alternative corridors include a pinyon-juniper mixed conifer woodland, and several types of deciduous and mixed woodlands. Woodlands comprise 45 percent of the natural vegetation communities within the Project alternative corridors.

The most dominant vegetation type within the project area is pinyon-juniper woodland, a multi-strata coniferous woodland. The typically open tree strata of this community are co-dominated by pinyon pine and either Utah juniper or Rocky Mountain juniper at higher elevations. The shrub understory contains big sagebrush and Gambel oak with grasses dominating the herb strata.

The deciduous woodlands within the project area include Gambel oak and mountain shrub mix. The latter is a diverse deciduous woodland or tall shrubland that is co-dominated by Gambel oak and mountain mahogany in association with serviceberry, snowberry and big sagebrush. Areas that are dominated primarily by Gambel oak are classified as Gambel oak woodland. These two deciduous woodlands occur in the transition zone between the montane coniferous forests and desert vegetation. The vegetation varies from dense thickets to isolated clumps that are separated by open areas of desert or grassland vegetation.

Pinyon-juniper woodlands with a shrub component of greater than 25 percent are classified as mixed woodlands. Areas in which big sagebrush dominates the shrub strata are classified as pinyon-juniper-sagebrush mixed woodland. In this community, the big sagebrush grows between the tree species. Pinyon-juniper woodlands in which Gambel oak dominates the shrub strata are classified as pinyon-juniper-oak mixed woodland. Pinyon-juniper woodlands in which Gambel oak, mountain mahogany, serviceberry and big sagebrush co-dominate the shrub strata are classified as pinyon-juniper-mountain shrub mixed woodland.

Wildlife. Several bird species favor semiarid pinyon-juniper woodland communities. These include gray flycatcher, juniper titmouse, gray vireo, pinyon jay, bushtit, and black-throated gray warbler. Wild turkeys occur here in winter, and juniper berries attract many wintering songbird species. Mammals include gray fox, pinyon mouse, western small-footed myotis, and bobcat. Pinyon-juniper woodlands and mountain shrub habitats also provide important winter range and transitional range for elk and mule deer. Sagebrush lizard, eastern fence lizard, and the juniper hairstreak (a butterfly) typically occur in these habitats. Other species associated with oak/shrub stands include Virginia's warbler, orange-crowned warbler, black-headed grosbeak, blue grouse, black bear, and mountain lion.

Forest Land

Vegetation Types. The forested lands within the project area include deciduous forests, within which aspens dominate the tree canopy; evergreen forests that are dominated by conifers; and mixed forests, which, in the project area, are co-dominated by conifers and either aspen or Gambel oak. Forested lands comprise 22 percent of the natural vegetation communities within the Project alternative corridors.

Deciduous Forests - Deciduous forests that are dominated by quaking aspen with understory shrubs such as snowberry, serviceberry and juniper are classified as aspen forests. Quaking aspen is the only major deciduous tree species in the Rocky Mountains. This species can be found on post-fire sites as well as forest margins (Peet 1988). Where Gambel oak is the primary shrub species and forms an understory shrubland community, these areas are classified as aspen-Gambel oak mixed forest.

Evergreen Forests - Ponderosa pine forests are coniferous forests that dominate the lower montane zone. Elevationally, this community occurs between the pinyon-juniper woodlands and spruce-fir forests. These forests are dominated by ponderosa pine in association with pinyon pine and Utah juniper or Rocky Mountain juniper at lower elevations, and Douglas fir and Colorado blue spruce at higher elevations. Colorado blue spruce usually occurs along streamsides where it can become a co-dominant (Peet 1988). Grasses form a dense understory within ponderosa pine forests.

In the upper montane zone, Douglas fir begins to replace ponderosa pine as the dominant conifer. Douglas firs often form dense stands on moist aspects and well-developed substrates as well as

being the dominant conifer species in relatively open stands on thinner, rockier substrates. Within the Douglas fir forests, ponderosa pine and white fir are the primary conifer associates.

An open Douglas fir forest community type was mapped for the Project analysis (KEA 1998). This community was associated with certain red sandstone canyon slopes where the vegetation was very sparse (total plant cover 10 to 50 percent). Douglas fir was the most abundant conifer, with ponderosa pine, Utah juniper and pinyon pine the associates; the total conifer cover was less than 10 percent. Gambel oak, mountain mahogany, serviceberry and mountain gooseberry all occurred in the shrub strata, though none were consistently dominant. Areas where Douglas fir forms a co-dominant with ponderosa pine (*i.e.*, higher elevations) are classified as ponderosa pine-Douglas fir mixed forest.

Spruce-fir forests characterize the sub-alpine region of the Rocky Mountains and are dominated by Englemann spruce and sub-alpine fir. Generally within any given stand Englemann spruce has the greater number of large trees while sub-alpine fir has the greater portion of seedlings and saplings. Within the project area Englemann spruce was most abundant near waterways, often in the riparian zone, and decreased in abundance upslope. Sub-alpine fir occurred on the shadiest slopes and ravines near the tops of mesas or in the coolest, most protected canyon bottoms. Forests where Englemann spruce is the sole dominant are classified as Englemann spruce forest.

Mixed Forest - Mixed forests are co-dominated by conifers and deciduous tree species. Six different mixed forests were mapped within the project alternative corridors, the most extensive being ponderosa pine-Gambel oak mixed forest, Douglas fir-Gambel oak mixed forest, and Douglas fir-aspen mixed forest. These mixed forest communities, and the others noted in *Table 3.6-1*, support at least 25 percent cover of the characterizing co-dominant species; however, other conifer and deciduous associate species make up these vegetation community types.

Wildlife. Each of the spruce-fir, aspen, and ponderosa pine forest communities in the project area provides important habitat for species including black bear, mountain lion, bobcat, coyote, pine squirrel, short-tailed weasel, montane vole, red-backed vole, red-tailed hawk, flammulated owl, and great horned owl. These forests also provide important summer habitat for elk and mule deer, including calving and fawning areas. Raptors nesting in aspen or spruce-fir forests include sharp-shinned hawk, Cooper's hawk, northern goshawk, saw-whet owl, and northern pygmy owl. Species found primarily in spruce-fir forests include red-breasted nuthatch, pine siskin, Cassin's finch, red crossbill, gray jay, American marten, snowshoe hare, and lynx. Typical wildlife species in aspen include western wood-pewee, red-naped sapsucker, warbling vireo, and tree swallow. Birds favoring ponderosa pine forests include Grace's warbler, pygmy nuthatch, western bluebird, and wild turkey. The pine white butterfly also favors ponderosa pine.

RIPARIAN

Vegetation Types. Riparian habitat is associated with many of the stream channels throughout the project alternative corridors. For the majority of these stream channels, a mix of riparian forest and shrub species dominated the associated riparian habitat; few herbaceous-dominated riparian areas were observed. Areas mapped as upland willow scrub are also included in the general category of riparian. Riparian areas comprise two percent of the natural vegetation communities within the project alternative corridors.

Most riparian species are restricted to areas with a high water table, and as such, are associated with streams, rivers and lake edges. Principal woody species include narrowleaf cottonwood, Russian olive, several species of willows, and tamarisk. Herbaceous species include sedges, rushes and cattails.

Upland willow shrub mix is a high elevation shrubland that is dominated by montane willow in association with juniper and gooseberry.

Wildlife. Riparian communities contain the greatest numbers and highest species diversity of wildlife. Birds such as mallard and other ducks, red-winged blackbird, yellow warbler, song sparrow, and Wilson's warbler occur over a large elevation range of riparian habitat. Beaver, common muskrat, water shrew, striped chorus frog, northern leopard frog, tiger salamander, terrestrial garter snake, and many dragonflies also occur in riparian zones.

Other Cover Types

Vegetation. Areas that have been converted to grow crops, or maintained landscaped areas, are not natural vegetation communities. Agricultural areas include croplands, hay meadows and orchards.

Areas that are dominated by rock (rock outcrops with less than 10 percent vegetative cover) or areas developed for residential and commercial uses are not considered to be a vegetation community. These other types of cover comprise 15 percent of the area within the project alternative corridors.

Wildlife. Rocky canyons and cliffs provide specialized habitats occupied by several species. Rock wren, canyon wren, canyon mouse, and northern rock mouse occupy cliffs full-time. Some bird species nest on rock cliffs while foraging elsewhere, including golden eagle, peregrine falcon, cliff swallow, violet-green swallow, and white-throated swift. Urban and agricultural areas attract barn swallow, European starling, house finch, American robin, striped skunk, raccoon, house mouse, and deer mouse. Common butterflies of agricultural areas are clouded sulphur and cabbage white.

SENSITIVE HABITATS

Sensitive habitats include those regulated by the federal government under the Clean Water Act (CWA), *i.e.*, jurisdictional wetlands and waters of the U.S., or the Endangered Species Act (ESA), *i.e.*, site-specific designated Critical Habitat areas for federally listed wildlife species. Sensitive habitats also include natural biotic communities listed by The Colorado Natural Heritage Program (CNHP), The Nature Conservancy (TNC), or other conservation organizations as rare or sensitive. BLM-designated Special Management Areas (SMA) and Areas of Critical Environmental Concern (ACEC) for biological conservation, and management areas as designated by the USFS, are also considered site-specific areas of biological importance or sensitivity.

United States Army Corps of Engineers (ACOE)

Wetland habitat is under the jurisdiction of the ACOE pursuant to Section 404 of the Clean Water Act of 1972, as amended in 1977 and 1984. Wetlands under the jurisdiction of the ACOE must meet specific vegetation, hydrological and soil criteria. Wetlands serve many functions including providing flood and sediment control, habitat for rare and common species, corridors for wildlife movement, and control of water quality and erosion (see Section 3.5). Formal jurisdictional wetland and "waters of the United States" determinations pursuant to the ACOE Wetlands Delineation Manual (1987) were not conducted for the Draft EIS analysis. The riparian habitats mapped during the field surveys were based strictly on vegetation parameters. It is anticipated that some subset of the riparian communities within the project area would qualify as jurisdictional wetlands. Similarly, any of the National Wetland Inventory (NWI) mapped features, *i.e.*, palustrine wetlands, as referred to in Section 3.5 would need field verification to determine whether they qualify as ACOE jurisdictional waters and/or wetlands. Such determinations, however, are only necessary where proposed direct or indirect impacts must be evaluated.

United States Fish and Wildlife Service (USFWS)

Under the federal Endangered Species Act the USFWS can designate "Critical Habitat" for endangered and threatened species (50 CFR Parts 17 or 226). Critical Habitat is a regulatory term that describes the areas of land, water and air space containing the physical and biological features that are essential for the survival and recovery of endangered and

threatened species. Designated Critical Habitat may include sites for breeding and rearing, movement or migration, feeding, roosting, cover and shelter. Habitats that may require special management and protection, such as water quality and quantity, host animals and plants, food availability, pollinators, sunlight, and specific soil types are also considered. Although Critical Habitat designation usually delineates only habitat occupied by a species during some period of its life cycle, the designation may include enough surrounding habitat to account for normal behavior and population growth. Habitat that is unoccupied, but suitable, occurring within a species' historical range may also be designated (Endangered Species Technical Bulletin 1993). No formally listed Critical Habitat areas coincide with the project area.

Additional Sensitive Habitats

There are 22 sensitive plant communities/associations listed by the CNHP that occur or potentially could occur within Montrose and San Miguel Counties and, therefore, also within the Nucla-Telluride Transmission Line project area. Five of these communities are known from, or have a high likelihood for, occurring within the project area as evaluated during Phase I of this Project and discussed with CNHP (Lyon 1999, pers. comm.): three types of montane riparian forests *(Populus angustifolia-Picea pungens/Alnus incana, Salix geyeriana-Salix monticola/-mesic graminoid* and *Populus angustifolia-Betula occidentalis*); lower montane riparian shrublands (*Betula occidentalis*), and beaked sedge montane wet meadow (*Carex utriculata*). *Table 3.6-2* lists these plant communities/associations, provides their Global and State Rankings, and lists the corresponding Southwest Colorado Interagency Vegetation Classification project community name that was employed for the study's vegetation mapping exercise. In many instances there is not an exact correspondence between the CNHP plant community designation and the interagency one. For example, there are three CNHP associations for montane riparian forests: *Abies lasiocarpa-Picea engelmanii/Alnus incana, Abies lasiocarpa-Picea engelmanii/Mertensia ciliata,* and *Populus angustifolia-Picea pungens/Alnus incana*. The first two would likely be included within the interagency's spruce-fir-aspen mix category, yet it is very likely that the interagency designation encompasses a broader range of associated species than noted for the CNHP association. For the purposes of the assessments conducted for the transmission line project, all areas mapped as riparian are being considered as the sensitive communities in the project area.

Aside from the federal protection afforded wetlands that are determined to be ACOE jurisdictional as discussed above, riparian corridors, riverine wetlands, and the neighboring upland slopes are generally considered sensitive because of the increased floristic diversity and importance as wildlife habitat and migration corridors provided by riparian systems. Within the project area in particular, the San Miguel River west of the State Highway 145 bridge, and all of Beaver, Saltado, and Bilk creeks have been evaluated by TNC and CNHP as being among the most diverse yet physically and functionally intact riparian systems remaining in Colorado (Willits 1997, SMWC 1997). These areas include riverine wetlands, river otter overall range, two bald eagle winter roost sites, and potential habitat for Mexican spotted owl, southwestern willow flycatcher, and several USFS sensitive species (see ***Plates BIO-1***, *Vegetation Communities* and ***BIO-2***, *Potentially Sensitive Wildlife Habitat*). The San Miguel River east of the State Highway 145 bridge, and other tributaries to this river, are relatively more disturbed than the portion west of the bridge; however, this eastern portion of the riparian system also contributes important hydrology functions, and provides important wildlife habitats in the project area.

The BLM designates site-specific areas of biological sensitivity as Special Recreation Management Areas (SRMA) and Areas of Critical Environmental Concern (ACEC). The BLM administrative areas include the important riparian and canyon habitats noted above. The SRMA covers 32,641 acres and includes a 20,000-acre ACEC (***Plate LAND-4***, *Planned Land Uses*). Management of these BLM areas emphasizes preservation of riparian ecosystems, scenic values, and recreation. Similarly, the USFS has designated management areas within the project area (***Plate LAND-4***, *Planned Land Uses*), and many of the woodland and forest vegetation communities provide habitat for several USFS and BLM sensitive species (see *Table 3.6-3* and Appendix B). Management of the USFS management areas emphasizes enhancing plant and animal diversity and wildlife habitat.

Table 3.6-2 **Sensitive Habitats Within the Nucla-Telluride Transmission Line Project Study Area**			
Colorado Natural Heritage Program			**Southwest Colorado Interagency Vegetation Classification[2]**
Common Name	**Scientific Name**	**Global/ State Rank[1]**	
Montane Riparian Forest	*Abies lasiocarpa-Picea engelmanii/Alnus incana*	G3; S3?	Spruce/Fir/Aspen Mix
Montane Riparian Forest	*Abies lasiocarpa-Picea engelmanii/Mertensia ciliata*	G5; S5	Spruce/Fir/Aspen Mix
Montane Riparian Forest	*Populus angustifolia-Betula occidentalis*	G3?; S2	Riparian
Thinleaf Alder-Red-Oiser Dogwood Riparian Shrubland	*Alnus incana-Cornus sericea*	G4; S3	Riparian
Montane Riparian Forest	*Populus angustifolia-Picea pungens/Alnus incana*	G3; S3	Riparian
Montane Riparian Forest	*Salix geyeriana-Salix monticola/mesic graminoid*	GU; S3	Riparian
Lower Montane Riparian Shrublands	*Betula occidentalis*	G3; S2	Riparian
Cottonwood Riparian Forest	*Populus angustifolia/Cornus sericea*	G4; S3	Riparian
Narrowleaf Cottonwood Riparian Forest	*Populus angustifolia/Salix ligulifolia-Shepherdia argentea*	G1; S1	Riparian
Foothills Riparian Shrubland	*Shepherdia argentea*	G4; S1	Riparian
Foothills Riparian Shrubland	*Forestiera pubescens*	GU; S1	Riparian
Lower Montane Willow Carrs	*Salix drummondiana/ Calamagrostis canadensis*	G3; S3	Riparian; Upland Willow Scrub
Drummonds Willow/Mesic Forb	*Salix drummondiana*/Mesic Forb	GU; S4	Riparian; Upland Willow Scrub
Coyote Willow/Mesic Graminoid	*Salix exigua*/Mesic Graminoid	G5; S5	Riparian
Montane Wet Meadow	*Carex aquatilis*	G5; S4	Not mapped but possibly could occur as small areas within montane forests
Beaked Sedge Montane Wet Meadow	*Carex utriculata*	G5; S4	Not mapped but possibly could occur as small areas within montane forests
Mesic Pinyon-Juniper Woodlands	*Juniperus osteosperma/ Amelanchier utahensis-Philadelphus microphyllus/ Leymus salinus*	GU; SU	Pinyon-Juniper/Mountain Shrub Mix
Mesic Pinyon-Juniper Woodlands	*Pinus edulis/Cercocarpus montanus*	G5; S4	Pinyon-Juniper/Mountain Shrub Mix
Xeric Pinyon-Juniper Woodlands	*Pinus edulis/Stipa comata*	G2; S2	Pinyon-Juniper
Lower Montane Forests	*Pseudotsuga mensiezii/ Acer glabrum*	G4; S1	Douglas Fir; Douglas Fir/Aspen/Oak Type; Douglas Fir/Aspen Mix; Douglas Fir/Gambel Oak Type
Mixed Foothill Shrublands	*Cercocarpus montanus/Stipa comata*	G2; S2	Mountain Shrub Mix
Mixed Mountain Shrubland	*Quercus gambelii-Cercocarpus montanus/Carex geyeri*	G3; S3	Mountain Shrub Mix; Gambel Oak

[1] Colorado Natural Heritage Program (CNHP)

CNHP - Global Rarity Ranking is based on the range-wide status of a species.

G1 - Critically imperiled globally because of extreme rarity (5 or fewer occurrences, or very few remaining individuals), or because of some factor of its biology making it especially vulnerable to extinction. (Critically endangered throughout its range).

G2 - Imperiled globally because of rarity (6 to 20 occurrences), or because of other factors demonstrably making it very vulnerable to extinction throughout its range. (Endangered throughout its range).

G3 - Very rare or local throughout its range or found locally in a restricted range (21 to 100 occurrences). (Threatened throughout its range).

G4 - Apparently secure globally, though it might be quite rare in parts of its range, especially at the periphery.

G5 - Demonstrably secure globally, though it may be quite rare in parts of its range, especially at the periphery.

GU - Unable to assign rank due to lack of available information.

CNHP - State Rarity Ranking is based on the status of a species (relative abundance of individuals) in each state.

S1 - Critically imperiled in state because of extreme rarity (5 or fewer occurrences, or very few remaining individuals), or because of some factor of its

Table 3.6-2
Sensitive Habitats Within the Nucla-Telluride Transmission Line Project Study Area

biology making it especially vulnerable to extirpation from the state. (Critically endangered in state).
S2 - Imperiled in state because of rarity (6 to 20 occurrences), or because of other factors demonstrably making it very vulnerable to extirpation from the state. (Endangered or threatened in state).
S3 - Rare in state (21 to 100 occurrences).
SU - Unable to assign rank due to lack of available information.
S#? - Indicates uncertainty about an assigned state rank.
[2] Southwest Colorado Interagency Vegetation Classification Project based upon Anderson et al (1976) A Land Use and Land Cover Classification System for Use with Remote Sensor Data.

Additional habitats are considered sensitive because they provide important breeding, sheltering, or foraging habitat for sensitive wildlife species. Sensitive wildlife habitats within the project area include (1) bald eagle winter range and roost sites on Wrights Mesa and San Miguel Canyon; (2) Gunnison sage grouse lek and surrounding nesting area on Beaver Mesa; (3) prairie dog towns west and southwest of Redvale which provide habitat for burrowing owls and other wildlife; (4) elk and mule deer winter range, winter concentration area, and severe winter range which occur on the entire project area from Nucla to Beaver Canyon, and portions of the southeastern half of the project area; (5) an elk calving area and migration corridor on Wrights Mesa; and (6) known wild turkey nesting and poult rearing areas south of Norwood (see ***Plate BIO-2***, ***Plate BIO-3***, and ***Plate BIO-4***).

SPECIAL STATUS SPECIES

Special status species include plant and animal species listed by the USFWS or CDOW as endangered, threatened, or candidate species; and plant and animal species listed by the CNHP, USFS, or BLM as sensitive or rare. Other species of local concern include vertebrate wildlife species of economic importance due to sport hunting or fishing, or species of high public interest. The USFS also considers effects to Management Indicator Species (MIS) to assess population viability.

Federally listed species that are known to occur, or that may occur in the project area are listed in *Table 3.6-3* along with their official listing status and details of occurrence. The species on the federal list receive legal protection under the ESA, as identified by the USFWS (USFWS 1997, 1998).

Additional species listed by the state, USFS Management Indicator Species, and other species of special concern by other resource agencies are listed in Appendix B. Species that are state-listed (*i.e.*, the river otter and wolverine), receive legal protection under the Colorado Revised Statutes 33-2-105 Article 2, as identified by the Colorado Wildlife Commission (1993). The CNHP maintains a comprehensive list of the statewide rare or imperiled plant and animal species. In addition, both the USFS (USDA 1998) and BLM (USDI 1998a) recognize some species as sensitive. Appendix B defines the special status assigned by these agencies; the abbreviations used in the table are defined in the legend. Other than those listed by the state (river otter and wolverine), the species included in Appendix B do not receive legal protection, although, impacts to such species could be considered significant under NEPA and the National Forest Management Act (NFMA) if the proposed impacts were considered severe, either individually or cumulatively.

The special status species that are either known to occur, or could potentially occur in the project area are further discussed below.

USFWS FEDERALLY PROTECTED PLANT SPECIES

There are no federally listed, or candidate plant species known to occur within the project area.

Table 3.6-3
Federally Listed and Candidate Plant and Animal Species Occurring Or Potentially Occurring Within the Nucla-Telluride Transmission Line Project Study Area

Species Name	Sensitive Status[1]	Habitat Affinity	Potential for Occurrence
Fish			
Humpback Chub (*Gila cypha*)	USFWS: LE; CDOW: E; CNHP: G1; S1	Aquatic	Not known to occur. Downstream populations potentially affected by water depletions.
Bonytail Chub (*Gila elegans*)	USFWS: LE; CDOW: E; CNHP: G1; SX	Aquatic	Not known to occur. Downstream populations potentially affected by water depletions.
Colorado Pikeminnow (*Ptychocheilus lucius*)	USFWS: LE; CDOW: E; CNHP: G1; S1	Aquatic	Not known to occur. Downstream populations potentially affected by water depletions.
Razorback Sucker (*Xyrauchen texanus*)	USFWS: LE; CDOW: E; CNHP: G1; S1	Aquatic	Not known to occur. Downstream populations potentially affected by water depletions.
Amphibians			
Boreal Toad (*Bufo boreas boreas*)	USFWS: C; CDOW: E; USFS: SS; CNHP: G4T1Q; S1	Riparian	Suitable habitat for this species exists in riparian and aquatic zones above 8,000'. No boreal toads were located during project related inventories in August of 2001.
Birds			
Southwestern Willow Flycatcher (*Empidonax traillii extimus*)	USFWS: LE; USFS: SS; CNHP: G5T2, SR	Riparian woodlands and shrublands	Known to occur, not known to breed. Two occurrences probably represent migrants. Suitable habitat exists in riparian zones of the San Miguel River and larger tributaries.
Bald Eagle (*Haliaeetus leucocephalus*)	USFWS: LT; CDOW: T; CNHP: G4; S1B,S3N	Riparian, agricultural lands, shrublands, and woodlands	Known to occur. Winter concentrations in canyons and mesas from Beaver Creek west.
Mexican Spotted Owl (*Strix occidentalis lucida*)	USFWS: LT; CDOW: T; CNHP: G3T3; S1B, SUN	Mixed conifer forests	Not known to occur. Suitable habitat exists in mixed conifer forest in canyons from upper Naturita Creek east.
Gunnison Sage Grouse (*Centrocercus minimus*)	USFWS: C USFS: MIS BLM: SS CNHP: G1; S1	Sagebrush and rangelands.	Resident population known to occur on Beaver Mesa and grouse occur in winter south of Naturita. Lek, breeding, and winter habitat exists in sagebrush rangeland.
Western Yellow-Billed Cuckoo (*Coccyzus americanus*)	USFWS: C CNHP-G5T3/SR USFS: SS BLM: SS	Lowland Riparian Woodlands.	Colorado Breeding bird survey data does not indicate that this species is breeding within or adjacent to the project area.
Mammals			
Black-Footed Ferret (*Mustela nigripes*)	USFWS: LE; CDOW: E; CNHP: G1;SH	Prairie dog towns in shrublands and grasslands	Not known to occur. Suitable habitat is prairie dog colonies of at least 200 prairie dogs and 10 prairie dogs/acre. Prairie dog colonies in the project area west of Redvale are currently too small and sparse and no suitable habitat exists for black-footed ferrets.

Table 3.6-3

Federally Listed and Candidate Plant and Animal Species Occurring Or Potentially Occurring Within the Nucla-Telluride Transmission Line Project Study Area

Species Name	Sensitive Status[1]	Habitat Affinity	Potential for Occurrence
Lynx *(Felis lynx canadensis)*	USFWS: T; USFS: SS; CDOW: E; CNHP: G5, S1	Spruce-fir, aspen, and riparian, wetter mixed conifer forests	May occur. Winter and summer foraging, and denning habitat delineated by USFS and BLM in project area.

[1] Status Codes:

Federal Agency:

U.S. Fish and Wildlife Service (USFWS): LE - Listed Endangered; LT - Listed Threatened; C - Candidate for listing

Bureau of Land Management (BLM), Colorado:

SS - Designated by BLM State Director, as species of special concern, as evidence by biological imperilment and downward trend in population abundance and distribution on BLM public lands within state (designation based on September 23, 1998 memorandum from State Director to District and Area Managers).

U.S. Forest Service (USFS), Region 2:

SS - Sensitive Species: those plant and animal species identified by the Regional Forester for which population viability is a concern as evidenced by: (a) Significant current or predicted downward trends in population numbers or density; and/or (b) Significant current or predicted downward trends in habitat capability that would reduce a species' existing distribution

State:

Colorado Division of Wildlife (CDW): SE - Endangered; ST - Threatened; SC - Species of Special Concern

Other:

Colorado Natural Heritage Program (CNHP)

Global Rarity Ranking is based on the range-wide status of a species.

G1 - Critically imperiled globally because of extreme rarity (5 or fewer occurrences, or very few remaining individuals), or because of some factor of its biology making it especially vulnerable to extinction. (Critically endangered throughout its range).

G2 - Imperiled globally because of rarity (6 to 20 occurrences), or because of other factors demonstrably making it very vulnerable to extinction throughout its range. (Endangered throughout its range).

G3 - Very rare or local throughout its range or found locally in a restricted range (21 to 100 occurrences). (Threatened throughout its range).

G4 - Apparently secure globally, though it might be quite rare in parts of its range, especially at the periphery.

G5 - Demonstrably secure globally, though it may be quite rare in parts of its range, especially at the periphery.

G#? Indicates uncertainty about an assigned global rank.

GQ Indicates uncertainty about taxonomic status.

G#T# Trinomial rank (T) is used for subspecies or varieties. These taxa are ranked on the same criteria as G1-G5.

State Rarity Ranking is based on the status of a species (relative abundance of individuals) in each state.

S1 - Critically imperiled in state because of extreme rarity (5 or fewer occurrences, or very few remaining individuals), or because of some factor of its biology making it especially vulnerable to extirpation from the state. (Critically endangered in state).

S2 - Imperiled in state because of rarity (6 to 20 occurrences), or because of other factors demonstrably making it very vulnerable to extirpation from the state. (Endangered or threatened in state).

S3 - Rare in state (21 to 100 occurrences).

S#B - Refers to the breeding season imperilment of elements that are not permanent residents.

S#N - Refers to the non-breeding season imperilment of elements that are not permanent residents. Where no consistent location can be discerned for migrants or non-breeding populations, a rank of SZN is used.

SH- Historically known from the state, but not verified for an extended period, usually >15 years; this rank is used primarily when inventory has been attempted recently.

Table 3.6-3

Federally Listed and Candidate Plant and Animal Species Occurring Or Potentially Occurring Within the Nucla-Telluride Transmission Line Project Study Area

Species Name	Sensitive Status[1]	Habitat Affinity	Potential for Occurrence

SZ - Migrant whose occurrences are too irregular, transitory, and/or dispersed to be reliably identified, mapped, and protected.
SX - Presumed extirpated from the state.
SU - Unable to assign rarity rank, often because of low search effort or cryptic nature of the element.
SR - Reported to occur in the state, but unverified.
*S3S4 - Watchlisted. Specific occurrence data are collected and periodically analyzed to determine whether more active tracking is warranted. Watchlisted species are indicated in this document with " * ".*

Sources:

U.S. Fish and Wildlife Service, Species List for the Nucla to Telluride Transmission Line Project. September 17, 2001.

U.S. Fish and Wildlife Service (USFWS). 1998. Endangered and Threatened Wildlife and Plants. 50 CFR 17.11 and 17.12. Special Federal Register Reprint. June 30.

U.S. Fish and Wildlife Service (USFWS). 1997. Endangered and Threatened Wildlife and Plants. 50 CFR 17.12. Special Federal Register Reprint. February 28.

U.S. Department of Agriculture, Forest Service. 1998. Letter dated February 11 from Richard Cook, District Ranger, Norwood, Colorado to Chris Keller, View Point West, Montrose, Colorado. Subject: Federally-listed and candidate species list; Forest Service sensitive species list; and species of special concern to be included in analysis of the Tri-State Powerline project.

U.S. Department of Interior, Bureau of Land Management. 1998. Letter dated September 23 from Ann Morgan, State Director, Colorado to District and Area Managers. Subject: State Director's Sensitive Species List.

Colorado Native Plant Society. 1997. Rare plants of Colorado. Falcon Press Publishing Company, Helena, Montana and Rocky Mountain Nature Association, Estes Park, Colorado. 105 pages.

Colorado Natural Heritage Program. 1997. Colorado's natural heritage: rare and imperiled animals, plants, and plant communities. Colorado Natural Heritage Program. 71 pages+.

Other Sensitive Plant Species

There are 14 plant species that are considered rare and imperiled by the CNHP (1997) that could potentially occur within the project area. Four of these plant species are considered sensitive by the BLM. Two of these species are considered sensitive by the USFS. The table included in Appendix B lists these sensitive species, their CNHP Global and State Ranking and Agency status, the habitats that they are known to occur in, and the potential for their occurrence within the project area.

USFWS Endangered, Threatened or Candidate Wildlife Species

There are six federally listed endangered animals (four fish, one bird, and one mammal species); three federally listed threatened animals (two bird species and one mammal species), and two candidate animals for federal listing (one amphibian and one bird) that are either known to occur or potentially could occur within the project area based on habitat affinities (*Table 3.6-3*). Of these species, three (southwestern willow flycatcher, bald eagle and Gunnison sage grouse) are known to occur within the project area, and three (Mexican spotted owl, lynx, and boreal toad) could potentially occur within the project area based on habitat affinities. These five species are discussed further below. Of the remaining animal species listed in *Table 3.6-3*, potential off-site effects to critical habitat in the Upper Colorado River Basin can impact four endangered fish species. The black-footed ferret is highly unlikely to occur in the project area due to lack of suitable habitat. These species are briefly discussed in Appendix B, Section 2.3.

Bald eagles occur in the project area as winter residents. During the night, groups of wintering bald eagles occupy nocturnal roosts in tall trees. During the day they may forage 20 or more miles from nocturnal roosts, often pausing singly or in small groups at day perch sites. At least 30 wintering bald eagles occupy nocturnal roosts along the San Miguel River near Horsefly Creek and 2 miles west of Nucla (BIO-Logic Research & Consulting 1998), and these eagles often forage in agricultural areas of Wrights Mesa, from Norwood west to about 2 miles west of Redvale. At least 35 additional wintering bald eagles occupy nocturnal roosts in Dry Creek Basin, and many of these eagles probably forage at least some of the time in the project area west of Norwood.

Southwestern willow flycatchers are not known to breed in the project area. A BLM database contains two records: one at Saltado Creek and the San Miguel River in late June, 1995 and one in Gurley Ditch from August, 1995. The nature of the sightings strongly suggests that these birds are migrants rather than breeding residents. Suitable habitat in the project area exists in riparian zones of the San Miguel River and larger tributaries below 8,500 feet.

Suitable habitat for federally threatened Mexican spotted owls occurs in the project area, in canyons below 9,000 feet along the San Miguel River and in the canyons of Naturita, Beaver, Saltado, Fall, Bear, Bilk creeks and the South Fork of the San Miguel River. No historic records exist for spotted owls in the San Miguel River drainage, and no spotted owls were found during field surveys for this project in 1998-1999 (BIO-Logic Research & Consulting 1998c and 1999).

In 1999–2000, CDOW released 96 lynx in the San Juan Mountains after determining that lynx were extirpated in the state or reduced to nonviable populations. Reintroduced lynx now occur widely in the San Juan Mountains including San Miguel and Dolores Counties. Suitable lynx habitat in Colorado includes coniferous forests of spruce and fir or lodgepole pine, and aspen or Douglas fir mixed with primary coniferous habitat. Lynx typically forage in uneven-aged forests with shrubs or small trees providing cover for snowshoe hares, their primary prey. Small forest openings with understory cover enhance foraging habitat, although lynx mostly avoid openings larger than several acres. Closed canopy forests with significant dead and down

trees provide optimum denning habitat. These wide-ranging solitary predators require very large habitat areas for population viability as well as connections between habitats permitting dispersal and gene flow. Within the project study area, USFS and BLM have delineated suitable denning, winter, and summer habitat (see Plate BIO-2). Suitable habitat within the project area is associated with spruce, fir, mixed aspen and conifer, Douglas fir, and any willow riparian or upland shrub communities in close association with these forest habitats.

Colorado pikeminnow, bonytail chub, razorback suckers, and humpback chubs, and portions of their critical habitat are found downstream of the project area in the Colorado River. Indirect impacts to these species would occur as a result of water depletions caused by the use of water for dust abatement applications.

The boreal toad, a candidate for federal listing, is not known to occur in the project area. Suitable habitat exists on Specie, Sunshine and Wilson Mesas, as well as Ilium Valley, Big Bear Creek, Saltado Creek, Elk Creek, and Bilk Creek. Project related surveys for this species conducted during August of 2001 did not locate any toads or tadpoles in suitable habitats within the project area.

Gunnison sage grouse, a recently recognized species, historically inhabited areas of southwestern Colorado and southeastern Utah covered by large expanses of sagebrush. Throughout its range, habitat degradation and other factors have reduced the distribution of this species to small population remnants. Project field surveys for this species in 1998 confirmed a resident flock of about 15 sage grouse on Beaver Mesa and located a lek (traditional strutting ground where sage grouse congregate in spring to breed) about one mile east of the existing line (BIO-Logic 1998d). A more secure breeding population occurs near Miramonte Reservoir, and a remnant population of uncertain status may remain near Gurley Reservoir. Some Gunnison sage grouse breeding in Dry Creek Basin winter in sagebrush expanses north of Nucla (BLM 1998).

Other Sensitive Invertebrate and Wildlife Species

Many of the animal species discussed above that are federally protected by USFWS are also listed as species of concern by other resource agencies. A total of 50 animal species that are considered sensitive by USFS, BLM, CDOW, and/or CNHP had the potential to occur within the project vicinity and hence were evaluated for this study. These additional sensitive animal species are listed in the table in Appendix B, along with their sensitivity status, habitat affinity, and potential for occurrence within the project alternative corridors. Most of these sensitive animal species are on more than one resource agency list; those listed by the USFS, BLM, and CDOW are summarized below. Refer to the table for an accounting of those species that are considered sensitive by CNHP.

There are 28 USFS sensitive species that are known to occur or potentially could occur within the project area (one fish, three amphibian, 17 bird and seven mammal species) (*Table 3.6-3* and Appendix B). Seven species are all known to occur within the project area (tiger salamander, southwestern willow flycatcher, fox sparrow, pygmy nuthatch, purple martin, flammulated owl, and ringtail). Twenty of the remaining species could potentially occur within the project area based on the presence of suitable habitat. Two species, the Baird's sparrow and pygmy shrew are not expected to occur within the project area due to the lack of appropriate habitat.

There are 15 BLM sensitive species that are known to or potentially could occur within the project area (one invertebrate, three fish, one amphibian, one reptile, five bird and four mammal species) (Appendix B). Only one of these species, the Gunnison sage grouse, is known to occur within the project area. The remaining 14 species could potentially occur within the project area due to the presence of suitable habitat.

There are 15 USFS Management Indicator Species that are known or potentially occur within the project area (seven bird, five mammal and three fish species) (Appendix B). These are: the American peregrine falcon, northern goshawk, hairy woodpecker, red crossbill, pinyon jay, Gunnison sage grouse, and Lewis' woodpecker; elk, mule deer, black bear, Abert's squirrel, and American marten; and rainbow trout, brown trout, and Colorado River cutthroat trout. Of these, 13 are known to occur.

There are nine animal species state-listed as endangered (four fish, one amphibian and four mammal species), three state-listed threatened bird species, and eight animals that are state species of concern (four fish, one amphibian, one reptile and two bird mammal species) that are either known to occur or potentially could occur within the project area (*Table 3.6-3* and Appendix B). Of these 20 species, only two, the state-listed endangered northern river otter and the state-listed threatened bald eagle, are known to occur within the project area. The remaining 18 species could potentially occur within the project area based on the presence of suitable habitat.

3.6.2 ENVIRONMENTAL CONSEQUENCES

3.6.2.1 ANALYTICAL FRAMEWORK

POTENTIAL TYPES OF IMPACTS

BOTANICAL IMPACTS

The following types of impacts to vegetation were considered for this analysis:

- Direct impacts to vegetation from modifications to SMPA's existing distribution system.
- Direct impacts to vegetation from removal of the existing 69 kV poles, hardware and conductors.
- Direct impacts to vegetation from modifications at existing or new substations. Impacts to vegetation at these facilities would arise due to site grading and road construction and construction of foundations, fence grounding, etc.
- Direct impacts to vegetation from construction of the 115 kV transmission line.
- Direct impacts to vegetation where existing access roads would be improved or widened.
- Direct impacts to vegetation from overland construction. Off-road vehicle use could result in impacts to vegetation from crushing and soil compaction, and increased erosion due to disturbances to the soil.
- Direct impacts to vegetation in areas where helicopter methods and foot crews would be used. Some groundwork would be done with the use of All Terrain Vehicles (ATV) or small trucks.
- Direct permanent impacts to vegetation within the right-of-way where the area must be managed to maintain necessary ground and conductor clearances.
- Direct and indirect impacts from maintenance, trimming or clearing of mature trees within the right-of-way, including the potential for habitat fragmentation and edge effects.
- Indirect impacts of exotic species introductions, resulting from seed transportation by construction vehicles and the creation of disturbed habitats that are conducive to colonization by exotics.

- Indirect impacts to vegetation from grading, excavating and filling during construction which could lead to increases in erosion and sedimentation rates in adjacent undisturbed areas.
- Direct and indirect impacts to vegetation from an increase in off-road vehicle use due to required maintenance activities for the lines once the Project has been constructed, and from recreational off-road use if any access roads are upgraded such that areas are now more accessible to the public.

Most of the area that would be affected by the Project during construction and long-term maintenance is occupied by relatively undisturbed native vegetation, therefore, impacts to native vegetation could potentially be extensive. Impacts to sensitive vegetation communities (jurisdictional wetlands, riparian vegetation communities, and important wildlife habitat) could be substantial due to the high concentration of these resources within the project area. However, under current plans the majority of the direct impacts to sensitive vegetation communities would be limited to the smallest area necessary at each pole location to install the pole structure and guy anchor holes; relatively small areas of impact where substations are being built or expanded; and select areas where road widening, new spur roads, or underground distribution segments are proposed. For the new pole sites, the pole locations can be shifted to avoid sensitive communities to the greatest extent practicable, or, any unavoidable placement within a sensitive community or important wildlife habitat would be accomplished in the least impactive manner. The most extensive disturbance would result from burying the distribution line, widening select access roads, and trimming or removing tall vegetation to maintain a safe clearance beneath the line.

The relative impacts on vegetation communities and sensitive plant species are assessed based on the sensitivity of these resources, the time period over which the impact would occur, whether the resource could recover to its pre-impact state, and the extent to which the function of the resource would be compromised after the impact. The assessment of vegetation community and botanical impacts is based upon the following criteria:

High Impacts – High impacts could occur if, or where, the Project would cause the permanent loss of wetland vegetation communities that are regulated by the federal government (jurisdictional vegetated wetlands), or the permanent loss of riparian and upland willow scrub, vegetation communities that are considered sensitive by the USFS, BLM, and CNHP. The Project is designed to avoid direct impacts on riparian corridors; however, if unavoidable losses of habitat occurred, these would be considered high.

High impacts could occur if, or where, project construction and maintenance would require tree-topping or removal of mature trees within the right-of-way where the alignment traverses any area of riparian communities or trees used as nesting sites by sensitive birds (see below).

High impacts could occur if direct losses would occur to any population of federally listed plant species. High impacts would also be assessed for impacts to populations of other sensitive plant species that are of regional concern where such a loss would jeopardize the continued existence of the population or viability of the species.

Moderate Impacts – Moderate impacts could occur where direct losses would occur to a population of non-federally listed sensitive plant species even though the loss would not jeopardize the continued existence of that population or viability of the species.

Low Impacts – Low impacts would occur where direct loss of a non-sensitive native upland vegetation community occurs, including woodlands and forested areas, sagebrush/grass mix, sagebrush parkland, grass/forb rangeland, agriculture and disturbed areas.

Wildlife Impacts

The following types of impacts to wildlife were considered for this analysis:

- Direct mortality by electrocution to large birds that attempt to perch on wires or structures, or small mammals inhabiting substations.
- Direct mortality to birds colliding with wires or structures during flight. Greatest potential impacts may occur to larger birds, especially fast-flying species such as peregrine falcons and forest hawks or less maneuverable species such as sandhill cranes and other large waterfowl. Night-migrating birds may also be vulnerable to collisions. Collision hazard is greatest where wires extend slightly above an adjacent forest canopy, where wires span canyons, or in areas of consistent high use by birds such as flight lines between common roosting and feeding areas or bird migration corridors.
- Direct mortality of wildlife by crushing or vehicle collisions during construction and subsequent maintenance activities.
- Indirect impacts from terrestrial habitat loss and alteration from removal or topping of trees, or removal or modification of riparian habitat.
- Indirect impacts to aquatic-dependent wildlife from loss of aquatic habitat due to water depletions, or degradation of aquatic habitat from project-caused erosion. Impacts could result to fish, amphibians, aquatic mammals, and raptors dependent on aquatic wildlife prey.
- Indirect impacts from disturbance including human presence and noise associated with construction and maintenance activities. Various sensitive wildlife species including the Gunnison sage grouse, southwestern willow flycatcher, mule deer and elk could be affected.
- Support structures and wires providing hunting perch sites for raptors, and causing indirect impacts to grouse, songbirds, small mammals, and reptiles through increased raptor predation.
- Support structures and wires providing perch sites for brown-headed cowbirds, which lay eggs parasitically in nests of other songbirds.
- Indirect impacts to wildlife from habitat fragmentation, where removal of habitat elements results in separation of formerly connected habitat patches.

As itemized above, impacts to wildlife would include disturbance and displacement of larger or more mobile animals during construction, crushing of smaller and less mobile animals, and temporary and permanent modification of habitat. The right-of-way is unlikely to modify wildlife movement patterns, except where new access roads are created and actively used. The relative impacts on wildlife are assessed based on the sensitivity of the species, its seasonal activities, and habitat-dependence as summarized in the following impact criteria:

High Impacts – High impacts would occur if, or where, project construction would likely result in direct or indirect impacts to federally listed species or their crucial habitat; direct or indirect impacts to non-listed sensitive wildlife of high regional concern that would jeopardize the continued existence of local or regional populations; or a trend towards federal listing, or a loss of species viability rangewide. High impacts would also include project effects likely to result in a loss of viability of sensitive species in the planning area of federal or state land management agencies.

Moderate Impacts – Moderate impacts would occur if, or where, direct or indirect impacts to less crucial habitat elements of federally listed species (for example, bald eagle day roost sites) results. Moderate impacts also include direct or indirect impacts to nonlisted sensitive wildlife such as birds of prey or big game where such impacts do not immediately jeopardize populations but which could result in sustained localized impacts including increased mortality, reduced breeding success, or displacement from crucial habitats. Moderate impacts are not likely to result in a trend towards federal listing, or in a loss of species viability rangewide. Finally, moderate impacts may adversely impact individuals, but are not likely to result in a loss of viability in the planning area of federal or state land management agencies.

Low Impacts – Low impacts occur where project construction would minimally affect, or have a low probability of affecting, any federally listed species or sensitive species of regional concern. Low impacts also include impacts to wildlife species considered to have low sensitivity to disturbance by the proposed Project because of their high abundance, low habitat specificity, or high tolerance of human disturbance. Due to the low probability of affecting, or anticipated minimal effect on a federally listed species, low impacts may also be considered a "may effect", but not likely to adversely effect due to discountable effects.

Applicable Permits, Standards and Ordinances

Depending upon the alternative selected and its unavoidable botanical and wildlife impacts, the following permits and authorizations may be required:

- Formal consultation with the U.S. Fish and Wildlife Service under Section 7 of the Endangered Species Act, as amended, has been initiated. The U.S. Fish and Wildlife Service will review the expected impacts to endangered, threatened, and candidate species to determine if they concur with the findings of this analysis.

- Notification to, or permit acquisition from, the ACOE would be required for more than minimal impacts to jurisdictional wetlands or waters in accordance with the federal Clean Water Act.

- Applicable Forest Service policies regarding endangered, threatened, or USFS sensitive plants and wildlife must be followed, as well as standards established by the NEPA and by ESA, as a condition of issuance of a Special Use Permit by USFS.

- Applicable Bureau of Land Management policies regarding endangered, threatened, or BLM sensitive plants and wildlife must be followed, as well as standards established by the NEPA and by ESA, as a condition of issuance of a Right-of-Way Grant by the BLM.

Environmental Protection Measures

In order to avoid or minimize impacts to biological resources, Tri-State has committed to implementing a number of Environmental Protection Measures (EPMs), including project design features. The majority of the EPMs identified in *Table 2.2-4* would reduce the Project's total effect on biological resources, including EPM numbers 1 through 11, 20 through 28, 32, 33, 36 through 41, 50, and 52 through 57. Because Tri-State has committed to these measures, they are considered part of the Project.

In addition to the measures set forth by Tri-State, both the USFS and BLM would require that where the Project traverses public lands, it would be built and maintained in accordance with numerous Best Management Practices mandated by these agencies. The majority of the EPMs identified in *Table 2.2-5* would reduce the Project's total effect on biological resources and include numbers 1 through 8, 10, 12, 14, 16, 18 through 20, 23 through 25, 27, 28, and 31 through 37.

The EPMs listed in *Table 2.2-4* will be implemented by Tri-State on all applicable public and private lands potentially affected by the Project. EPMs listed on *Table 2.2-5* will primarily be implemented on federal lands. EPMs on *Table 2.2-5* that pertain to compliance with the Endangered Species Act would also be implemented on private lands.

3.6.2.2 IMPACTS COMMON AMONG THE TRANSMISSION ALTERNATIVES

The majority of potential impacts to biological resources would result in "no identifiable effect" due to the comprehensive EPMs that would be implemented for the Project. Impacts that are common among the project alternatives are discussed first, followed by impact summaries for each of the alternatives. In addition, a number of the sensitive plant and animal species listed in *Table 3.6-3* were determined to be unaffected by, or not applicable to, the Project. A brief discussion of why these species are not applicable to the Project is presented in Appendix B.

IMPACTS TO VEGETATION COMMUNITIES AND BOTANICAL RESOURCES

Vegetation clearance - Vegetation within the 115 kV transmission line right-of-way may need to be managed to maintain necessary ground to conductor clearances (see Appendix A-1, ***Figures A-1.2-4*** and ***A-1.2-5***). The sag clearance between a conductor and vegetation is normally 18 feet. Therefore, the actual point above the ground where the sag clearance must be assured under a single pole (lowest conductor at 38 to 70 feet above ground) would range between 20 and 52 feet; for H-frame poles (lowest conductor at 47 to 74 feet above ground) the sag clearance would range between 29 and 56 feet. Furthermore, for the lowest point of the conductor sag between poles, vegetation would need to be limited to six feet in height. For vegetation types such as aspen and the conifer forests, some short trees could remain throughout the right-of-way, although periodic maintenance would be necessary as trees grew in height. By comparison, most trees within the pinyon-juniper vegetation community could probably remain due to the relative low height of the trees and their slow growth rate. For purposes of assessing this vegetation management need, it is assumed that the majority of the trees within rights-of-way that traverse aspen- or conifer-dominated vegetation communities, or riparian woodlands, would be trimmed or removed as necessary to reduce their vertical height. Tri-State's commitment to implementing EPMs 5, 20, 24, 36, 50, and 57 (*Table 2.2-4)* throughout the Project, and compliance with EPMs 24 and 25 on USFS and BLM lands *(Table 2.2-5)*, would certainly reduce this effect. However, the residual direct impacts to vegetation from vegetation management within aspen- or conifer-dominated vegetation communities and riparian woodlands could be low to moderate. In all other communities the potential impact would be reduced to a level of "no identifiable effect."

To varying degrees, the vegetation communities within the right-of-way would be affected. The acreages reported for the various alternatives are the total vegetation amounts within a 100-foot wide right-of-way. The implementation of any of the alternatives would actually cause impacts only: (1) at each pole location (approximately 0.6 acre per structure); (2) where road widening and spur roads (14-foot wide roads) are necessary; and (3) where vegetation maintenance is required to assure a safe clearance between the vegetation canopy and the conductors and the line. Moreover, because Tri-State is committed to implementing numerous EPMs that would minimize marring the land and, to the degree feasible, ensure maintenance, or recovery, of the natural landscape, the overall residual direct impacts to vegetation would be expected to be low.

Stream channels - Each alternative has the potential to impact riparian habitat as numerous streams would be traversed. Tri-State is committed to avoid physical disturbance in wetlands, streams, and riparian areas where practicable (EPMs 8 through 11, 20, 21, 22, 32, 33, 36 through 40, and 57). The USFS and BLM will also require several conservation practices where the Project traverses streams on federal land (*Table 2.2-5*, EPMs 2 through 8, 14, 16, 19, and 20). With implementation of these measures, most direct (i.e., removal of riparian vegetation) and

indirect (i.e., siltation and erosion) impacts to riparian vegetation would be reduced to a "no identifiable effect." Additional agency-required (U.S. Army Corps of Engineers) compensatory mitigation would further ensure that impacts to stream channels and the riparian communities associated with them throughout the project area are reduced to a low level of impact. As discussed above, however, impacts to riparian habitats (including riparian-dependent wildlife) could potentially range from low to moderate due to the extent of tree trimming that could be required to maintain an adequate conductor sag clearance.

Exotic species - Any project-related surface disturbance could lead to invasion of the newly disturbed area by exotic weed species. The increase in exotic species invasion that could occur at the pole sites, road widening areas, and spur roads, would be a moderate level of impact. However, because Tri-State is committed to implementing EPM 23 from *Table 2.2-4*; and, where any project component coincides with federal land, EPM 23 from *Table 2.2-5*, the direct and indirect impacts to native plant communities would be low. Similarly, it is anticipated that the relatively minor ground disturbance from the Project would cause no adverse effect on native plant species diversity within the project area.

Sensitive plants - No sensitive plant species are known to occur within the study corridor of any of the project alternatives; however, 14 sensitive plants have the potential to occur in the project area based on their occurrence within the region, and/or their association with the vegetation communities that coincide with the project alternative corridors (Appendix B). These include nine species associated with pinyon-juniper woodlands or shrublands (Payson lupine, pygmy sagebrush, Naturita milkvetch, Wetherill milkvetch, weak-stemmed mariposa lily, slender rock-brake, Paradox breadroot, little penstemon, and abajo penstemon), and five species associated with montane forests or specialized micro-habitats within these forests (canyon bog-orchid, pale moonwort, showy whitlow-grass, Altai cottongrass, and Altai chickweed). Impacts to sensitive plant species could potentially range from low to high depending upon the number and size of population(s) impacted, relative to known occurrences. Because Tri-State would comply with EPM 31 (*Table 2.2-5*) on all federally managed land, the impacts to sensitive plants on federally-managed portions of the Project are expected to be avoided. However, impacts to sensitive plant species on private lands could potentially range from low to high.

Fire Use and Vegetation Management - The construction of the alternatives could affect Fire Management Plans (FMPs) for areas traversed by the transmission line. Fire is an important ecological force in shaping community structure and species diversity for many vegetation communities including ponderosa pine forests and quaking aspen stands. A fire suppression management strategy for areas in close proximity to the poles and substations would be required to protect these structures. Fire suppression policies can result in shifts in community structure (*i.e.*, shift from open woodlands to dense forests) and species composition (*i.e.*, shift from fire tolerant to intolerant species). The need for a fire suppression management strategy for areas currently not traversed by a transmission or distribution line could constrain the objectives of both USFS and BLM FMPs. The BLM's Uncompahgre Field Office Fire Management Plan identifies the need for fire suppression in certain areas for the protection of a wide variety of facilities and structures as well as biological resources such as riparian zones along the San Miguel River and bald eagle roosting trees. This FMP also identifies certain biological resources that require fire use as a management tool where a type of community or a mosaic of vegetation communities is desirable, such as, sage grouse sites where the sagebrush is being invaded by woody species; mule deer and elk winter concentration areas; and elk calving areas. The extent and level of impact of fire suppression activities on vegetation management could range from low to high depending upon the area requiring suppression activities as well as the quality and sensitivity of the resource(s) being managed.

Impacts to Federally Protected and Candidate Wildlife Species

Bird and small mammal electrocution - All alternatives present a potential impact from electrocution of raptors and other large perching birds such as common ravens. Tri-State is committed to design and construction standards (EPM 56 from *Table* 2.2-4 and EPM 27 from *Table* 2.2-5) that are known to effectively eliminate or minimize risk of bird electrocution. Because the likelihood of electrocution of federally threatened bald eagles and other large perching birds is low, electrocution hazard of all alternatives may affect the raptor species but is unlikely to adversely affect because of discountable effects. For all alternatives, electrocution of small mammals such as rodents, skunks, or raccoons could also occur at substations where they may contact charged wires. Such mortality would be unlikely to affect regional populations of any small mammal species, and the impacts would be low.

Bird collisions - Mortality of birds by collision with wires could occur. However, none of the alternatives cross or approach bald eagle nocturnal roosts, therefore, bald eagle collisions are not anticipated. Similarly, none of the alternatives cross or approach bird concentration areas such as large wetlands, therefore, the potential for waterfowl collision is not high. Each alternative spans canyons and most cross forest patches, where the risk of bird collision increases. Migrating waterfowl and songbirds generally fly much higher that the maximum height of the proposed transmission line, except possibly some canyon spans. Tri-State would comply with EPM 56 from *Table* 2.2-4 and EPM 28 from *Table* 2.2-5 that will minimize bird collisions. This would include, where determined to be necessary, installation of distribution underbuilds in a horizontal arrangement; use of non-dulled conductors for canyon crossings; using static wire the same size as the transmission conductor where spanning canyons (or eliminating static wires altogether at canyon crossings by using surge arresters); avoiding placement of new lines in the mist/fog zone of canyons; locating power lines near the tree canopy; placing bird flight diverters on isolated spans of wire protruding above the forest canopy; grouping new power lines with existing lines where feasible; and using a horizontal configuration for the lines. While some collisions may occur, the impact on bird species is considered low for all alternatives. In particular, for bald eagle known to occur in the project area, and for Mexican spotted owl, which could potentially occupy suitable habitat in the project area in the future (see below), these two federally listed species are not expected to be adversely effected by potential collisions with the new lines due to discountable effects.

Mexican spotted owl -Each alternative except the Nucla-Norwood Northern and Central Alternatives cross suitable habitat for the Mexican spotted owl, and the above two alternatives pass within one mile of some suitable habitat. Therefore, all alternatives could potentially impact Mexican spotted owls through disturbance by construction and maintenance activities. Because no spotted owls were found during surveys in the project area, the habitat is presumed to be unoccupied and construction is highly unlikely to cause disturbance to spotted owls. In the event that habitat becomes occupied in the future, Tri-State would comply with EPM 33 from *Table* 2.2-5 which will avoid disturbance to nesting spotted owls. For the three alternatives that coincide with Mexican spotted owl habitat, direct impacts could occur if habitat becomes occupied in the future. Impacts could occur from owl electrocution or collisions with wires, and habitat loss through cutting or topping of trees. Impacts from electrocution and collision are considered low (discussed under bird electrocutions and collisions, above). The design measures noted above that would minimize collision with transmission lines by Mexican spotted owl, include using non-dulled conductors for canyon crossings; using static wire the same size as the transmission conductor where spanning canyons; avoiding placement of new lines in the mist/fog zone of canyons; locating power lines near the tree canopy; and placing bird flight diverters on isolated spans of wire protruding above the forest canopy. Tree removal or topping could remove large, old trees usable by spotted owls for nesting or roosting, or occupied by small mammal prey species. A strip of cleared right-of-way in previously unbroken forest stands could fragment spotted owl

habitat, reducing the capability of surrounding forest patches to support spotted owls. These impacts on Mexican spotted owls, if present in the future, would be moderate.

Bald Eagle - Bald eagles are in the project area during the winter months. There are no bald eagle nests within the project area. Communal night roosts are present on the San Miguel River north of Norwood, and day roosting occurs on Wrights Mesa in large cottonwood trees. A total of 35 to 60 bald eagles forage in this area from late November through March. Collisions with structures, electrocution, or disturbance from maintenance and construction are potential impacts from this project. As shown in the preceding sections on collisions, electrocutions, and Mexican spotted owls, committed mitigation should essentially eliminate the potential for collisions or electrocutions. Seasonal restrictions on construction and routine maintenance would eliminate disturbance impacts.

Southwestern willow flycatcher - All alternatives cross or approach small areas of suitable breeding habitat for southwestern willow flycatchers. Tri-State would comply with EPM 32 from *Table 2.2-5* that will prevent direct impacts from construction and routine maintenance activities to southwestern willow flycatchers. While there is a slight chance that emergency maintenance could cause disturbance to breeding birds, or breeding birds could occur undetected, breeding habitat in the project area is marginal in quality and unlikely to be occupied by breeding willow flycatchers. The low likelihood of emergency maintenance coinciding with presence of breeding birds makes the chance of direct impacts remote. Indirect impacts from new perch sites causing increased avian predation or nest parasitism are also unlikely, because many perch sites already exist in trees or on existing transmission lines adjacent to or within the small habitat patches.

Lynx – The Norwood-Sunshine and the Norwood-Telluride Alternatives both cross small areas of USFS-delineated lynx habitat. The *Canada Lynx Conservation Assessment and Strategy Report* (August 2000) documents risk factors to lynx productivity, mortality and movement relative to utility corridors as follows:

"Utility corridors can have both short and long term impacts to lynx habitats, depending on location, type (e.g. gas pipelines, powerlines), vegetation clearing requirements and maintenance access. The primary potential impact of powerlines is to disrupt the connectivity of lynx habitat. When located adjacent to highways and railroads, utility corridors can further widen the right-of-way, thus increasing the likelihood of impeding lynx movement. Remote, narrow utility corridors may have little to no effect on lynx, or could even enhance habitat in certain vegetation types and conditions." (page 2-18)

The Norwood-Telluride and Norwood-Sunshine alternatives both cross small amounts of lynx summer, winter and denning habitats. Within these habitats, the Norwood-Sunshine Alternative would consist of rebuilding existing lines while the Norwood-Telluride Alternative would establish a new utility corridor in some areas.

In denning habitat, impacts to lynx could result from May through August due to disturbance by construction and maintenance activities and increased public use of new or improved access roads. In other lynx habitats and movement corridors, increased human activity on winter snow by snowmobile, snowshoe, or ski may allow coyotes or bobcats greater access to deep-snow habitats and result in increased predation on or competition with lynx. Because lynx habitat in the project area is naturally fragmented, interspersed with residential development, and maintenance activities would be infrequent, these project alternatives are unlikely to prevent lynx movements or otherwise adversely affect lynx populations in the region.

Sage grouse - All of the alternative routes coincide on Beaver Mesa with the existing 69 kV transmission line, which traverses year-round habitat occupied by Gunnison sage grouse on private lands. Impacts to sage grouse potentially include increased avian predation, habitat avoidance near overhead structures, reduced breeding or nesting success from human disturbance, and direct habitat

loss. The impacts would be the same for all alternatives. The existing 69 kV line bisects occupied year-round sage grouse range on Beaver Mesa and passes within approximately 0.7 mile of the Beaver Mesa lek, within approximately 0.5 mile of the Beaver Mesa North lek, and within approximately 1.2 miles of the Beaver Mesa South lek (***Plate BIO-2***). The existing 69 kV line would be replaced by a taller 115 kV line using single poles 65 feet to 87 feet tall supporting three conductors and a ground wire stacked vertically. No new access roads would be constructed. The new taller line could potentially provide more effective raptor hunting perch sites and increase habitat avoidance by sage grouse reacting to overhead structures. Tri-State is committed to special construction standards within Beaver Mesa sage grouse overall range and an additional one-mile buffer area (EPM 52, *Table* 2.2-4) to minimize raptor perching on line support structures. Despite this, some raptors may still perch on support structures or transmission wires and increased avian predation on sage grouse may occur. Sage grouse may also abandon habitat near the new line in response to a taller overhead structure, causing incremental loss of habitat additional to the area already affected by the existing line. To reduce disturbance impacts to breeding sage grouse, Tri-State is committed to avoiding construction on Beaver Mesa in or near sensitive breeding habitats during the lek attendance and nesting seasons (EPM 53, *Table* 2.2-4), and no impacts on sage grouse from construction disturbance would occur. Future maintenance activities could disturb sage grouse at the lek or during the nesting season, although these impacts would be similar to those from the existing line. On Beaver Mesa, the impacts of all alternatives on Gunnison sage grouse would be moderate.

Boreal Western Toad - No historic records for boreal toads are known for the project area. Suitable habitat exists on Specie, Sunshine and Wilson Mesas, as well as Ilium Valley, Big Bear Creek, Saltado Creek, Elk Creek, and Bilk Creek. The suitable habitat sites were surveyed for this species in August of 2001, and no adult toads or tadpoles were located.

Fish - Four fish species are listed as federally endangered that could be affected by project-related water depletions. These include the humpback chub (*Gila cypha*), bonytail chub (*Gila elegans*), Colorado pikeminnow (*Ptychocheilus lucius*) and the razorback sucker (*Xyrauchen texanus*). Populations of the four endangered fish, in the Colorado River, would be negatively impacted by the estimated two acre foot water depletion that would be caused by dust abatement applications. Tri-State's commitment to pay applicable depletion fees (EPM 58, *Table* 2.2-4) would offset potential effects to federally protected fish to low levels.

IMPACTS TO OTHER SENSITIVE WILDLIFE

Raptors - For each alternative construction and maintenance activities during the nesting season could affect raptor productivity by causing nest abandonment or mortality of adult-dependent juvenile birds. Tri-State would comply with EPM 35 (*Table* 2.2-4) which would avoid disturbance of nesting raptors during construction, but future maintenance activities could disturb nesting raptors up to one half mile from the right-of-way. Maintenance visits are expected to be infrequent, and impacts to nesting raptors would be considered low for all alternatives.

Elk and mule deer - All alternatives could affect elk and mule deer in winter by increasing stress-caused mortality or displacing animals from public lands to private lands resulting in increased damage to agricultural property. Tri-State's commitment to EPM 54 (*Table* 2.2-4) will avoid construction effects on wintering deer and elk on crucial winter habitats (winter concentration areas and severe winter range). Winter maintenance activities could occasionally affect wintering deer and elk. Some big game mortality could also result from collisions on roads with construction or maintenance vehicles. However, all of these impacts are unlikely to affect population size or overall distribution of mule deer or elk, and the impacts to each species are considered low for all alternatives.

Riparian wildlife - Each alternative crosses or approaches riparian areas potentially occupied by sensitive riparian-dependent wildlife including tiger salamander, leopard frog, and songbirds including some neotropical migrants. Potential impacts to wildlife include habitat loss, distur-

bance, and mortality during construction through crushing. Tri-State's commitment to EPMs would minimize damage to riparian vegetation, wetlands, and surface waters; any unavoidable habitat loss is likely to be limited to topping of tall trees. Disturbance and crushing of some riparian wildlife could occur during construction, and to a lesser extent during maintenance. Impacts of all alternatives to riparian-dependent wildlife would be moderate. The impacts would be greater than impacts to forest-sensitive wildlife due to the scarcity of riparian habitats and limited distributions of riparian-dependent wildlife species. Based upon the distribution of riparian habitats within the project area, none of the project alternatives would impact the viability of species rangewide or result in a decline in the viability of local populations.

Forest wildlife - Each alternative affects areas of forest habitat potentially occupied by forest-dependent sensitive species including northern goshawk, boreal owl, flammulated owl, northern three-toed woodpecker, olive-sided flycatcher, Grace's warbler, golden-crowned kinglet, Lewis' woodpecker, and pygmy nuthatch. Most of these species require forest interiors, mature forest, or old-growth forest stands. Each alternative could affect these species if they are present through habitat loss, disturbance, or direct mortality such as crushing. Clearing or topping of trees would cause habitat loss for forest-interior species, but may be neutral or enhance habitat for species capable of using forest edges and small openings. Disturbance by construction may affect some species during breeding seasons, but overall would be more temporary and less severe for most upland species compared to riparian wildlife because of the greater extent and availability of upland forest habitats. Direct mortality, primarily from crushing, could occur to ground-dwelling or arboreal species during construction and maintenance activities. The overall impacts of all forest-affecting alternatives on forest-dependent sensitive wildlife would be low. Based upon the distribution of forest habitat and forest dependent sensitive species within the project area, none of the project alternatives would impact the viability of species rangewide or result in a decline in the viability of local populations.

3.6.2.3 IMPACTS OF THE PRIMARY TRANSMISSION ALTERNATIVES

Appendix B contains the detailed GIS tables of impacts to vegetation communities and wildlife species from the various project components for each alternative. Summaries of those findings are presented below.

Nucla-Norwood Northern Alternative

Table 3.6-4 provides a summary of the impacts to vegetation communities from the project alternative. Overall, the Nucla-Norwood Northern Alternative would have the least impact to the total range, woodland, forest, riparian habitat, stream crossings and agriculture communities among the three Nucla-Norwood Alternatives. This alternative would follow the existing 69 kV line, thereby restricting impacts to an alignment that was previously disturbed and minimizing impacts to currently undisturbed habitat.

Table 3.6-5 provides a summary of the potential effects of this alternative on wildlife known or likely to occur in the project area. As presented throughout this section, Tri-State would implement numerous EPMs that would ensure avoidance or minimization of impacts to biological resources. Through incorporation of the measures discussed, all potentially high impacts would be reduced to a lower level. Moreover, through incorporation of these measures the potential impacts to many of the resources that coincide with the alternatives would be reduced to such a level that no impact has been identified for the Project. Therefore, in *Table 3.6-5*, an entry of "no identifiable effect" indicates that although the resource is present impacts would be avoided or mitigated. An entry of "none" indicates that the resource does not coincide with the alternative. Residual effects of low to moderate are noted as applicable.

Table 3.6-4
Potential Impacts to Vegetation Communities and Land Cover Types from the Transmission Alternatives

Vegetation Communities	Nucla-Norwood Alternative			Norwood-Telluride Alternative	Norwood-Sunshine Alternative
	Northern Alternative	Central Alternative	Southern Alternative		
Rangeland					
Grass/Forb Rangeland (GRF)	17.59	24.60	24.08	157.66	151.31
Sagebrush Parkland (SGP)	1.87	3.98	3.98		
Sagebrush/Grass Mix (SGG)	13.83	50.49	53.59	24.39	24.39
Rangeland Totals	**33.29**	**79.07**	**81.65**	**182.05**	**175.70**
Woodland					
Pinyon-Juniper (PJN)	60.72	165.35	148.46	3.04	3.04
Gambel Oak (GOK)	0.39	0.39	0.39	94.17	83.33
Pinyon-Juniper/Sagebrush Mix (PSX)	3.68	25.33	60.21	0.17	0.17
Pinyon-Juniper/Mountain Shrub Mix (PMX)	3.49	4.20	16.49	28.80	28.80
Woodland Totals	**68.28**	**195.27**	**225.55**	**126.18**	**115.34**
Forest Land					
Aspen (ASP)				42.39	23.43
Englemann Spruce (ESP)				2.12	1.57
Douglas Fir (DFR)				23.11	3.36
Douglas Fir/Open Type (DFO)				9.45	2.68
Ponderosa Pine/Douglas Fir Mix (PDX)				9.94	—
Ponderosa Pine/Gambel Oak (PPG)				11.57	11.58
Douglas Fir/Gambel Oak Type (DFG)			2.49	18.13	2.94
Douglas Fir/Aspen Mix (DFA)				29.25	—
Douglas Fir/Aspen/Gambel Oak Type (DAO)				4.37	0.58
Englemann Spruce/Aspen Mix (ESA)				7.26	1.25
Forest Land Totals			**2.49**	**157.59**	**47.39**
Riparian					
Riparian (RIP)	0.37	1.38	1.34	14.09	4.68
Upland Willow Scrub (UWS)				0.75	0.76
Riparian Totals	**0.37**	**1.38**	**1.34**	**14.84**	**5.44**
Subtotal of Impacts to the Natural Vegetation Communities	**101.94**	**275.72**	**311.03**	**480.66**	**343.87**
Other Land Cover Types					
Rock (RCK)	0.38	1.25	0.38	2.97	—
Urban/Built Up (URB)	1.59	3.53	3.53	1.98	0.20
Agriculture (AGR)	95.62	98.70	104.97	21.24	21.24
Subtotal of Impacts to Other Land Cover Types	**97.59**	**103.48**	**108.88**	**26.19**	**21.44**
Total Impacts from the Proposed Project	**199.53**	**379.20**	**419.91**	**506.85**	**365.31**

115 kV Transmission Line Effects

Vegetation Communities and Botanical Resources. Approximately half of the nearly 200 acres that could be affected by the 115 kV transmission line is comprised of natural vegetation communities (*Table 3.6-4*); the remainder has mostly been converted for agriculture. Vegetation communities within the right-of-way would include approximately 33 acres of rangeland, 68 acres of woodland (most of which is pinyon-juniper), and less than one acre of riparian communities. The road widening impacts necessary for this alternative would be restricted

to pinyon-juniper, pinyon-juniper/mountain shrub mix, sagebrush parkland and agricultural communities. Through implementation of the EPMs, all impacts to vegetation and botanical resources would be low except to riparian communities, where impacts are considered low to moderate in degree.

While the Nucla-Norwood Northern Alternative would largely coincide with the existing 69 kV right-of-way, some widening of the existing right-of-way is expected to be necessary to accommodate the new 115 kV line. No portion of this alternative would traverse tree-dominated communities. Therefore, for the majority of the line, the need for tree trimming or removal is expected to be minimal to none. However, tall trees could occur in the riparian vegetation communities that are traversed by the line, and scattered tall trees (i.e., the mature cottonwoods that grow in some of the agricultural fields) occur near this alternative. The trimming or removal of even isolated trees would be considered a high impact if the trees are part of a riparian system, or provide important perch or nesting sites for wildlife. Impacts to riparian habitats from this alternative could occur at one location, an unnamed tributary to Naturita Creek at Link 1, mile marker 1.3 (on BLM land). Additionally, the proposed alignment would cross another six non-riparian streams (i.e., no riparian habitat associated with these streams), all of which occur on private lands. With implementation of the EPMs, the residual direct and indirect impacts to riparian habitats should be low. However, if the proposed right-of-way maintenance resulted in unavoidable impacts to mature riparian trees, impacts from trimming or removing trees in riparian habitats or isolated mature cottonwoods could be low to moderate.

Through implementation of EPM 23 (*Table* 2.2-4 and 2.2-5) the potential impact for exotic species invasion would be low. Similarly, no effects on native plant species diversity or habitat fragmentation or edge effects are anticipated from this alternative.

While no sensitive plant species are known to occur within the study corridor for the Nucla-Norwood Northern Alternative, Payson lupine is documented as occurring near Naturita (***Plate BIO-1***). This species is considered imperiled globally and within Colorado either because of its rarity or because of other factors that make it very vulnerable to extinction throughout its range (Spackman *et al* 1997). As such, if potential impacts occurred to this species, the effects would be moderate to high, depending upon the number of individuals impacted. An additional eight sensitive plant species associated with pinyon-juniper woodlands and shrublands (see Section 3.6.2.2 "Impacts Common Among the Transmission Alternatives") have the potential to occur along this alternative (Appendix B). Where surface disturbance would occur within habitat suitable to support sensitive plants on private lands, impacts could potentially range from low to high depending upon the number and size of population(s) impacted, relative to known occurrences.

Wildlife — Federally Listed. This alternative traverses the most bald eagle winter habitat on Wrights Mesa (***Plate BIO-2*** and *Table 3.6-5*). Impacts to bald eagles from electrocution and collision would be low (see Section 3.6.2.2). Avoidance of winter construction and routine maintenance activities in the bald eagle winter concentration area (EPM 36, *Table 2.2-5*) would prevent disturbance of bald eagles by most project activity, and the impact would be low. Although bald eagle nesting has never been recorded in the project area, if it occurs, Tri-State would avoid impacts from construction and maintenance activities (EPM 37, *Table 2.2-5*), and no impacts on nesting bald eagles are likely to occur.

Approximately one mile of this alternative (Link 2, mile markers 3.2 to 4.2) would be constructed within one mile of suitable habitat for Mexican spotted owls in Naturita Canyon (see *Table 3.6-5* and ***Plate BIO-2***). If the habitat becomes occupied in the future, low impacts from maintenance disturbance would be the same as those for the Central Alternative and less than those for the Southern Alternative, which traverses suitable habitat.

Table 3.6-5

Comparison of Potential Impacts to Sensitive Wildlife from the Nucla-Telluride Transmission Line Project Alternatives

Biological Resource Issues	Nucla-Norwood Alternative			Norwood-Telluride Alternative	Norwood-Sunshine Alternative
	Northern Alternative	Central Alternative	Southern Alternative		
115 kV Transmission Line Effects					
Bald eagle- mortality through electrocution	No Identifiable Effect*	No Identifiable Effect	No Identifiable Effect	None*	None
Bald eagle-mortality through collision with transmission wires	Low impact	Low impact	Low impact	Low impact	Low impact
Bald eagle- indirect impacts from disturbance at day roost sites and foraging areas	No Identifiable Effect	No Identifiable Effect	No Identifiable Effect	None	None
Bald eagle- direct impacts to day roost sites	Low impact	Low impact	Low impact	None	None
Mexican spotted owl- indirect impacts from disturbance	No Identifiable Effect	No Identifiable Effect	No Identifiable Effect	No Identifiable Effect	No Identifiable Effect
Mexican spotted owl-direct loss of habitat	None	None	Moderate impact if spotted owls present, 7 acres of suitable habitat within ROW.	Moderate impact if spotted owls present, 134 acres of suitable habitat within ROW.	Moderate impact if spotted owls present, 48 acres of suitable habitat within ROW.
Mexican spotted owl-mortality through collisions	None	None	Low impact if spotted owls present, 0.5 mile of line traverses suitable habitat.	Low impact if spotted owls present, 11 miles of line traverses suitable habitat.	Low impact if spotted owls present, 4 miles of line traverses suitable habitat.
Southwestern willow flycatcher-indirect impacts due to increased predation and nest parasitism from increased perch sites.	No Identifiable Effect	None	None	No Identifiable Effect	No Identifiable Effect
Southwestern willow flycatcher-indirect impacts due to disturbance at nest sites.	No Identifiable Effect	None	None	No Identifiable Effect	No Identifiable Effect
Lynx-indirect impacts due to disturbance	None	None	None	Low impact, ROW in USFS-designated lynx habitat	Low impact, ROW in USFS-designated lynx habitat
Boreal toad- direct loss of habitat	None	None	None	No Identifiable Effect	No Identifiable Effect
Boreal toad- mortality	None	None	None	None	None
Gunnison sage grouse-indirect impacts from increased avian predation, and habitat avoidance from presence of overhead structures.	None	No Identifiable Effect	No Identifiable Effect	Moderate impact, Beaver Mesa population. 3,090 acres of overall range, 1,720 acres of nesting habitat within 1 mile of line.	Moderate impact, Beaver Mesa population. 3,090 acres of overall range, 1,720 acres of nesting habitat within 1 mile of line.
Gunnison sage grouse- indirect impacts from disturbance	None	Low during maintenance	Low during maintenance	Moderate during maintenance	Moderate during maintenance
Gunnison sage grouse-direct loss of habitat	None	Low impact, winter habitat south of Nucla.	Low impact, winter habitat south of Nucla.	Low impact, Beaver Mesa population.	Low impact, Beaver Mesa population.

Table 3.6-5
Comparison of Potential Impacts to Sensitive Wildlife from the Nucla-Telluride Transmission Line Project Alternatives

Biological Resource Issues	Nucla-Norwood Alternative			Norwood-Telluride Alternative	Norwood-Sunshine Alternative
	Northern Alternative	Central Alternative	Southern Alternative		
Special status fish- indirect impacts from water depletion of Upper Colorado River Basin	Low impact during construction	Low impact during construction	Low impact during construction	Low impact during construction	Low impact during construction
Other raptors-indirect impacts from disturbance at nest sites.	Low during maintenance	Low during maintenance	Low during maintenance	Low during maintenance	Low during maintenance
Other raptors-direct loss of habitat.	No Identifiable Effect	No Identifiable Effect	Low impact. 2.5 acres of forest types (aspen plus all conifer except pinyon-juniper) within 100-foot ROW	Low impact. 126 acres of forest types (aspen plus all conifer except pinyon-juniper) within 100-foot ROW	Low impact. 47 acres of forest types (aspen plus all conifer except pinyon-juniper) within 100-foot ROW
Elk-indirect impacts from disturbance in winter range (WR).	Low impact. 22,897 acres of WR within 1 mile of ROW.	Low impact. 26,946 acres of WR, within 1 mile of ROW.	Low impact. 25,362 acres of WR within 1 mile of ROW.	Low impact. 26,357 acres of WR within 1 mile of ROW.	Low impact. 19,348 acres of WR within 1 mile of ROW.
Elk- indirect impacts from disturbance in winter concentration area (WCA), severe winter range (SWR), migration corridors (MC), and calving areas (CA).	Low during maintenance. 1,996 acres of WCA, and 12.392 acres of SWR within 1 mile of ROW.	Low during maintenance. 2,047 acres of WCA and 19,732 acres of SWR within 1 mile of ROW.	Low during maintenance. 2,776 acres of WCA and 2,037 acres of SWR within 1 mile of ROW.	Low during maintenance. 4,675 acres of WCA, 6,620 acres of SWR, and 595 acres of MC within 1 mile of ROW.	Low during maintenance. 4,990 acres of WCA, 3,364 acres of SWR, 2,872 acres of MC, and 533 acres of CA within 1 mile of ROW.
Mule deer-indirect impacts from disturbance in winter range (WR).	Low impact. 22,89WR within 1 mile of ROW.	Low impact. 26,946 acres of WR, within 1 mile of ROW.	Low impact. 25,362 acres of WR within 1 mile of ROW.	Low impact. 21,678 acres of WR within 1 mile of ROW.	Low impact. 16,152 acres of WR within 1 mile of ROW.
Mule deer- indirect impacts from disturbance in winter concentration area (WCA), and severe winter range (SWR).	Low during maintenance. 17,441 acres of WCA, and 16,812 acres of SWR within 1 mile of ROW.	Low during maintenance. 19,828 acres of WCA, and 17,274 acres of SWR within 1 mile of ROW.	Low during maintenance. 20,563 acres of WCA, and 19,002 acres of SWR within 1 mile of ROW.	Low during maintenance. 3,919 acres of WCA, and 6,500 acres of SWR within 1 mile of ROW.	Low during maintenance. 3,919 acres of WCA, and 3,260 acres of SWR within 1 mile of ROW.
Other forest-dependent sensitive wildlife-habitat loss, disturbance, or mortality	None	None	Low impact. 7 acres of forest habitat within 1/4 mile of line.	Low impact. 3,333 acres of forest habitat within 1/4 mile of line.	Low impact. 1,829 acres of forest habitat within 1/4 mile of line.
Other riparian-dependent sensitive wildlife- disturbance or mortality	Moderate impact. 1 riparian stream crossing and 6 non-riparian stream crossings.	Moderate impact. 3 riparian stream crossings and 12 non-riparian stream crossings.	Moderate impact. 4 riparian stream crossings and 19 non-riparian stream crossings.	Moderate impact. 9 riparian stream crossings and 16 non-riparian stream crossings.	Moderate impact. 6 riparian stream crossings and 19 non-riparian stream crossings.
Substation Effects					
Mexican spotted owl- indirect impacts from disturbance	None	None	None	No Identifiable Effect	No Identifiable Effect
Elk-indirect impacts from disturbance in winter range (WR).	Low impact. 2,057 acres of WR within 1 mile of Norwood Substation.	Low impact. 2,057 acres of WR within 1 mile of Norwood Substation.	Low impact. 2,057 acres of WR within 1 mile of Norwood Substation.	Low impact. 2,057, 3, 1,220, and 1,617 acres of WR within 1 mile of Oakhill, Specie Mesa, Wilson Mesa, and Telluride Substations, respectively.	Low impact. 2,057 and 1,152 acres of WR within 1 mile of Oakhill and Sunshine Substations respectively.

Table 3.6-5
Comparison of Potential Impacts to Sensitive Wildlife from the Nucla-Telluride Transmission Line Project Alternatives

Biological Resource Issues	Nucla-Norwood Alternative			Norwood-Telluride Alternative	Norwood-Sunshine Alternative
	Northern Alternative	Central Alternative	Southern Alternative		
Elk- indirect impacts from disturbance in winter concentration area (WCA), severe winter range (SWR), migration corridors (MC), and calving areas (CA).	Low during maintenance. 676 acres of WCA within 1 mile of Norwood Substation	Low during maintenance. 676 acres of WCA within 1 mile of Norwood Substation	Low during maintenance. 676 acres of WCA within 1 mile of Norwood Substation	Low during maintenance. 244 acres of WCA, 3 acres of SWR, and 516 acres of MC within 1 mile of the Wilson Mesa Substation; 640 acres of SWT and 40 acres of MC within 1 mile of Telluride Substation.	Low during maintenance. 520 acres of SWR within 1 mile of Norwood Substation
Mule deer-indirect impacts from disturbance in winter range (WR).	Low impact. 2,057 acres of WR within 1 mile of Norwood Substation.	Low impact. 2,057 acres of WR within 1 mile of Norwood Substation.	Low impact. 2,057 acres of WR within 1 mile of Norwood Substation.	Low impact. 2,057, 3, and 1,000 acres of WR within 1 mile of Oakhill, Wilson Mesa, and Telluride Substations, respectively.	Low impact. 2,057 and 520 acres of WR within 1 mile of Oakhill and Sunshine Substations, respectively.
Mule deer- indirect impacts from disturbance in winter concentration area (WCA), and severe winter range (SWR).	Low during maintenance. 711 acres of WCA within 1 mile of Norwood Substation	Low during maintenance. 711 acres of WCA within 1 mile of Norwood Substation	Low during maintenance. 711 acres of WCA within 1 mile of Norwood Substation	Low during maintenance. 25 acres of WCA within 1 mile of Oakhill Substation; 3 acres of SWR within 1 mile of Wilson Mesa Substation; and 640 acres of SWR within 1 mile of Telluride Substation.	Low during maintenance. 25 acres of WCA within 1 mile of Oakhill Substation; and 520 acres of SWR within 1 mile of Sunshine Substation.
Special status fish- indirect impacts from water depletion of Upper Colorado River Basin	Low impact during construction	Low impact during construction	Low impact during construction	Low impact during construction	Low impact during construction
Distribution System Effects					
Bald eagle- indirect impacts from disturbance at day roost sites and foraging areas.	None	No Identifiable Effect	No Identifiable Effect	None	None
Bald eagle- direct impacts to day roost sites.	None	Low impact	Low impact	None	None
Mexican spotted owl- indirect impacts from disturbance.	None	None	None	No Identifiable Effect	None
Mexican spotted owl-direct loss of habitat	None	None	None	Moderate impact if spotted owls were present, 38 acres suitable habitat within ROW.	None
Mexican spotted owl-mortality through collisions and electrocution	None	None	None	Low impact if spotted owls were present. 3 miles of line traverses suitable habitat.	None

Table 3.6-5

Comparison of Potential Impacts to Sensitive Wildlife from the Nucla-Telluride Transmission Line Project Alternatives

Biological Resource Issues	Nucla-Norwood Alternative			Norwood-Telluride Alternative	Norwood-Sunshine Alternative
	Northern Alternative	Central Alternative	Southern Alternative		
Southwestern willow flycatcher-indirect impacts due to disturbance	None	No Identifiable Effect	No Identifiable Effect	No Identifiable Effect	None
Lynx-indirect impacts due to disturbance	None	None	None	Low impact, ROW in USFS-designated lynx habitat	Low impact, ROW in USFS-designated lynx habitat
Other raptors-indirect impacts from disturbance at nest sites.	Low during maintenance	Low during maintenance	Low during maintenance	Low during maintenance	Low during maintenance
Elk-indirect impacts from disturbance in winter range (WR).	None	Low impact. 16,790 acres of WR within 1 mile of existing 69kV line to be removed, or existing 69kV line to be retained as distribution line.	Low impact. 22,575 acres of WR within 1 mile of existing 69kV line to be removed, or existing 69kV line to be retained as distribution line.	Low impact. 11,338 acres of WR 1 mile of existing 69kV line to be removed, or existing 69kV line to be retained as distribution line, or new distribution line to be constructed.	Low impact. 4,268 acres of WR within 1 mile of existing 69kV line to be removed, or existing 69kV line to be retained as distribution line, or new distribution line to be constructed.
Elk- indirect impacts from disturbance in winter concentration area (WCA), severe winter range (SWR), migration corridors (MC), and calving areas (CA).	Low during maintenance	Low during maintenance. 963 acres of WCA and 11,327 acres of SWR within 1 mile of existing 69kV line to be removed, or existing 69kV line to be retained as distribution line.	Low during maintenance. 1,875 acres of WCA and 12,153 acres of SWR within 1 mile of existing 69kV line to be removed, or existing 69kV line to be retained as distribution line.	Low during maintenance. 1,500 acres of WCA, 1,515 acres of SWR, 2,848 acres of MC, and 522 acres of CA within 1 mile of existing 69kV line to be removed, or existing 69kV line to be retained as distribution line, or new distribution line to be constructed.	Low during maintenance. 50 acres of WCA within 1 mile of existing 69kV line to be removed, or existing 69kV line to be retained as distribution line, or new distribution line to be constructed.
Mule deer-indirect impacts from disturbance in winter range (WR).	None	Low impact. 16,790 acres of WR within 1 mile of existing 69kV line to be removed, or existing 69kV line to be retained as distribution line.	Low impact. 22,575 acres of WR within 1 mile of existing 69kV line to be removed, or existing 69kV line to be retained as distribution line.	Low impact. 5,783 acres of WR within 1 mile of existing 69kV line to be removed, or existing 69kV line to be retained as distribution line, or new distribution line to be constructed.	Low impact. 4,268 acres of WR within 1 mile of existing 69kV line to be removed, or existing 69kV line to be retained as distribution line, or new distribution line to be constructed.
Mule deer- indirect impacts from disturbance in winter concentration area (WCA), and severe winter range (SWR).	None	Low during maintenance. 16,154 acres of WCA and 15,528 acres of SWR within 1 mile of existing 69 kV line to be removed or existing line to be retained as distribution line.	Low during maintenance. 17,185 acres of WCA and 16,548 acres of SWR within 1 mile of existing 69 kV line to be removed or existing line to be retained as distribution line.	Low during maintenance. 547 acres of WCA and 1,515 acres of SWR within 1 mile of existing 69 kV line to be removed, or existing line to be retained as distribution line, or new distribution line to be constructed.	Low during maintenance. 547 acres of WCA within 1 mile of existing 69 kV line to be removed, or existing line to be retained as distribution line, or new distribution line to be constructed.

Table 3.6-5
Comparison of Potential Impacts to Sensitive Wildlife from the Nucla-Telluride Transmission Line Project Alternatives

Biological Resource Issues	Nucla-Norwood Alternative			Norwood-Telluride Alternative	Norwood-Sunshine Alternative
	Northern Alternative	Central Alternative	Southern Alternative		
Other riparian-dependent sensitive wildlife- disturbance or mortality.	None	Moderate impact. 1 riparian stream crossing and 4 non-riparian stream crossings.	Moderate impact. 1 riparian stream crossing and 6 non-riparian stream crossings.	None	Moderate impact. Parallels 1 riparian stream for 1/4 mile and 1 non-riparian stream crossing.

* *An entry of "no identifiable effect" indicates that although the resource indicated coincides with that alternative, project-committed or required design and construction measures would avoid or mitigate the potential impact. An entry of "none" indicates that the resource does not coincide with the alternative. An entry of "Low impact" to special status species indicates a "may affect" but highly unlikely impact to species protected in accordance with the ESA, Section 7.*

Wildlife — Other Sensitive. This alternative would have low impacts on elk, mule deer, and nesting raptors, and low or no impacts on sensitive species utilizing agricultural, pinyon-juniper woodland, or shrub habitats. Moderate impacts to riparian-dependent species would occur from construction and maintenance disturbance, although this alternative crosses the least number of streams and would affect the least amount of riparian habitat (*Table 3.6-5*). This alternative also impacts the least amount of land overall, crosses the least amount of relatively undisturbed native woodlands and shrublands, and therefore would cause the least impacts on sensitive upland wildlife.

Norwood Substation Effects

Vegetation Communities and Botanical Resources. No more than two acres of grass/forb rangeland, pinyon-juniper/sagebrush mix, and pinyon-juniper/mountain shrub mix would be affected by enlargement of the Norwood Substation. Impacts to these communities would be considered low, including the potential increase in exotic species invasion.

No sensitive plant species are known from immediately adjacent to the Norwood Substation. The nine sensitive plant species discussed for the 115 kV transmission line have the potential to occur at the substation; however, this potential is considered low within the small area where the substation would be enlarged. If sensitive plant species were present their numbers would likely be small; therefore, impacts at this location would be expected to be low.

Wildlife. The Norwood Substation component could incrementally affect elk and mule deer by permanently removing 1.9 acres of habitat at the edge of elk and mule deer winter range and deer winter concentration area. Elk and deer disturbance by winter maintenance activities would also occur. Because of the relatively small amount of affected habitat and its location at the periphery of winter concentration areas, impacts to deer and elk would be considered low. However, cumulative impacts with other development in big game winter concentration areas south of Norwood may cause a greater incremental impact to deer and elk. Impacts to other sensitive species using pinyon-juniper or mountain shrub habitats would be considered none or low.

69 kV Transmission Line and Distribution System Effects

Vegetation Communities and Botanical Resources. Because the distribution system would be constructed as an underbuilt on the 115 kV line, no additional impacts to vegetation communities or botanical resources would result from installation of the distribution system beyond those already discussed for the 115 kV line above.

Wildlife. No additional impacts to wildlife would occur.

Nucla-Norwood Central Alternative

Table 3.6-4 summarizes the potential impacts to vegetation communities from the Nucla-Norwood Central Alternative. Overall, the Central Alternative is the second least-impactive alternative to the total range, woodland, forest, stream crossings and agriculture communities among the three Nucla-Norwood Alternatives. *Table 3.6-5* provides a summary of the potential effects of this alternative on wildlife known or likely to occur in the project area.

115 kV Transmission Line Effects

Vegetation Communities and Botanical Resources. The 115 kV line right-of-way would encompass approximately 237 acres, of which 193 acres are comprised of natural vegetation communities (*Table 3.6-4*). Vegetation communities within the right-of-way would include approximately 48 acres of rangeland, 144 acres of woodlands, and one acre of riparian communities. Sagebrush/grass mix is the most dominant rangeland that would be affected by this alternative, and pinyon-juniper is the most dominant woodland within the right-of-way that would be affected. The road widening impacts necessary for this alternative would also affect pinyon-juniper, pinyon-juniper/sagebrush mix, pinyon-juniper/mountain shrub mix, sagebrush parkland, sagebrush/grass mix, grass/forb rangeland, riparian and agricultural communities. Through implementation of the EPMs (*Tables* 2.2-4 and 2.3-5), all impacts to vegetation and botanical resources would be low, except to the riparian communities, where impacts would be considered low to moderate.

Similar to the Nucla-Norwood Northern Alternative, no portion of this alternative traverses tree-dominated communities; therefore, for the majority of the line, the need for tree trimming is expected to be minimal to none. The effects of right-of-way tree trimming for this alternative would be similar to those described for the Nucla-Norwood Northern Alternative (*i.e.*, low to moderate for trimming within riparian communities).

Impacts to riparian communities from this alternative could potentially occur at three locations: along Naturita Creek at Link 4 mile marker 0.9 (private land); along Naturita Creek at Link 5 between mile markers 4.8 and 4.9 (private land); and at an unnamed stream course at Link 4 mile marker 2.1 (BLM land). Additionally, the proposed alignment would cross another 12 streams that do not support riparian habitat. Seven of these non-riparian streams occur on private land while the remaining five occur on BLM land. With implementation of relevant EPMs, the impacts to riparian habitats and streams should be low. However, removal of mature riparian tree species, especially mature cottonwoods, from the right-of-way as part of the project's maintenance activities could result in moderate impacts.

The potential for an increase in exotic species invasion along the 115 kV line would be considered low due to implementation of EPM 23 (*Tables* 2.2-4 and 2.2-5) that would offset this potential impact (see Section 3.6.2.2 "Impacts Common Among the Transmission Alternatives"). Similarly, the alternative would not affect native plant species diversity within the project area.

Nine sensitive plant species (associated with pinyon-juniper woodlands and shrublands) have the potential to occur along the 115 kV line (see Section 3.6.2.2). Where surface disturbance would occur within habitat suitable to support sensitive plants on private lands, impacts could potentially range from low to high.

Wildlife — Federally Listed. Potential impacts for wintering bald eagles are similar to those for the Northern Alternative. However, this alternative traverses less than half as much bald eagle winter habitat on Wrights Mesa (***Plate BIO-2*** and *Table 3.6-5*), and low impacts on bald eagles would be less. Potential impacts to Mexican spotted owl habitat in Naturita Canyon would be the same as for the Northern Alternative.

Wildlife — Other Sensitive. This alternative would be constructed through Gunnison sage grouse winter habitat north of Naturita. In this area the line would be parallel to the existing Nucla-Cahone 115 kV transmission line which already provides raptor hunting perches and overhead structures. The proposed alternative would be unlikely to increase avian predation on sage grouse or cause sage grouse to avoid habitat in response to overhead structures. Construction would not occur in winter because of the closure for big game winter range (EPM 54, *Table* 2.2-4), that coincides with affected sage grouse winter range. Consequently, no grouse

disturbance would occur from construction. Some disturbance of wintering sage grouse may occur from routine maintenance activities. Because such activity would be infrequent and grouse are less sensitive to disturbance in winter than during the breeding season, the impact would be low.

Low impacts to elk and mule deer would be similar to those for the Northern Alternative, although winter ranges south of Naturita Creek are less altered by human use and big game may be more easily disturbed there in winter by maintenance or other human activity.

Low impacts to nesting raptors, and low to no impacts on other sensitive upland wildlife, would be slightly greater than those for the Northern Alternative, because of the greater amount of native habitats crossed by the Central Alternative. The Central Alternative crosses more streams than the Northern Alternative and less than the Southern Alternative, so moderate impacts would be correspondingly intermediate among the alternatives.

Norwood Substation Effects

Vegetation Communities and Botanical Resources. Vegetation and botanical impacts would be the same as those described for the Nucla-Norwood Northern Alternative.

Wildlife. Impacts to wildlife would be the same as those described for the Northern Alternative.

69 kV Transmission Line and Distribution System Effects

Vegetation Communities and Botanical Resources. Approximately 31 acres of rangeland, 51 acres of woodland (mostly pinyon-juniper), and 0.36 acre of riparian would be within the distribution system right-of-way. These acreages also reflect the 0.7-mile segment of line that would be retained, and where right-of-way tree trimming may occur. Through implementation of the EPMs, only the impacts to riparian communities would be low to moderate. No additional impacts would occur from the 0.3-mile of distribution line that would be underbuilt with the 115 kV line.

Potential impacts to riparian habitats may occur at one location on BLM land, a tributary to Naturita Creek at Link 1, mile marker 1.3. The dismantling of a majority of the existing 69 kV line could potentially impact three non-riparian streams, while the retention of the 0.7 mile segment of the existing 69 kV line for the distribution system would continue to cross one non-riparian stream. All four of these streams occur on private property. Potential impacts to riparian habitats and streams may occur if poles are located within or near riparian habitats and streams. Also, the dropping of the old wire from these poles could cause damage to the riparian habitat. These potential impacts may be considered moderate; however, they would be short-term and temporary, as the vegetation would be expected to recover. As a beneficial effect, removing poles from within or near riparian habitats, and removing wire suspended over these areas would also remove perches for predators and nest parasitizers.

The increase in exotic species invasion that could occur from the dismantling of the existing 69 kV line would be reduced to a low impact with implementation of EPM 23 (*Table* 2.2-4 and 2.2-5).

No sensitive plant species are known to occur along the existing 69 kV line. Nine sensitive plant species (associated with pinyon-juniper woodlands and shrublands) have the potential to occur (see "Impacts Common Among the Alternatives"). Where surface disturbance would occur within habitat suitable to support sensitive plants on private lands, impacts could potentially range from low to high.

Wildlife. Construction and operation of the distribution system would have low impacts on wintering bald eagles northwest of Redvale, as described for the Northern Alternative 115 kV line.

Dismantling of the existing 69 kV line would not occur in winter within crucial big game winter ranges, and would have minimal low impacts on elk and mule deer. Maintenance of distribution lines would have low impacts on elk, mule deer, nesting raptors, and other sensitive upland wildlife. A moderate impact to riparian-dependent wildlife species could occur at one riparian stream crossing.

Nucla-Norwood Southern Alternative

Table 3.6-4 provides a summary of the impacts to vegetation communities from this project alternative. The Southern Alternative is the most impactive alternative to the total range, woodland, forest, stream crossings and agriculture communities among the three Nucla-Norwood alternatives. Moreover, because this alternative does not follow an existing line and would widen existing seismic disturbances for access roads, a greater amount of undisturbed habitat would be affected along this alignment compared to the other two alternatives. Indirect impacts from increased access would also be greatest among the three alternatives, including the potential for noxious weeds or exotic species. *Table 3.6-5* provides a summary of the potential effects of this alternative on wildlife known or likely to occur in the project area.

115 kV Transmission Line Effects

Vegetation Communities and Botanical Resources. Over 90 percent of the approximately 221 acres that would be within the right-of-way of the 115 kV transmission line is comprised of natural vegetation communities. Vegetation communities includes approximately 48 acres of rangeland, 157 acres of woodland (most of which is pinyon-juniper and pinyon-juniper/sagebrush mix), over two acres of forest land (Douglas fir/Gambel oak), and less than one acre of potential effect to riparian communities. The road widening for this alternative would affect pinyon-juniper, pinyon-juniper/sagebrush mix, pinyon-juniper/mountain shrub mix, sagebrush parkland, sagebrush/grass mix, grass/forb rangeland and riparian communities. With implementation of the EPMs, most impacts to vegetation communities and botanical resources would be low. Low to moderate impacts may result to riparian communities from the construction of the 115 kV line and access roads.

For the majority of the line the need for tree trimming or removal is expected to be minimal to none. However, a small portion of this alternative traverses tree-dominated communities (*i.e.*, 2.49 acres of Douglas fir/Gambel oak type), and tall trees may occur in the riparian vegetation communities that are traversed by the line. Trees within these communities may need to be trimmed or removed. Impacts to riparian communities from this alternative could also potentially occur at four locations: along Naturita Creek at Link 4 mile marker 0.9 (private land); an unnamed tributary to Naturita Creek at Link 6 mile marker 5.5 (BLM land); an unnamed stream course at Link 6 mile marker 9.5 (BLM land); and an unnamed stream course at Link 4 mile marker 2.1 (BLM land). Additionally, 19 non-riparian streams potentially would be crossed. Nine of these streams occur on BLM land while the remaining ten are on private land. With implementation of the EPMs, impact from trimming/removal of trees within a riparian system, or those that provide important perch or nesting sites for wildlife, would be low to moderate. Similarly, impacts to riparian habitats and streams should be low.

Because EPM 23 will be implemented, the residual impacts to native plant communities from an increase in exotic species invasion would be considered less than significant. It is anticipated that the effects on native plant species diversity within the project area would be none. Habitat fragmentation and associated edge effects are not expected to occur.

Nine sensitive plant species have the potential to occur along the 115 kV line (see Section 3.6.2.2 "Impacts Common Among the Transmission Alternatives"). Where surface disturbance would occur within habitat suitable to support sensitive plants on private lands, impacts could potentially range from low to high.

Wildlife — Federally Listed. This alternative avoids most of the bald eagle winter concentration area, and low impacts to bald eagles as described for the Northern Alternative would be slight.

This alternative crosses about 0.5 miles of suitable habitat for Mexican spotted owls in Naturita Canyon. If the habitat becomes occupied in the future, low impacts could occur from collision, and moderate impacts could occur from habitat loss from tree removal or topping, affecting up to seven acres.

Wildlife — Other Sensitive. Low impacts to wintering Gunnison sage grouse would be the same as impacts of the Central Alternative. Low impacts to elk and mule deer would be similar to impacts of the Central Alternative. Low, impacts to nesting raptors, sensitive woodland and shrubland species, and other wildlife would be greatest for this alternative because it crosses the greatest amount of undisturbed habitat and requires the most road widening. This alternative crosses about 0.5 miles forest habitat in Naturita Canyon, and would cause low impacts to some forest-dependent sensitive wildlife by habitat loss, fragmentation, or construction and maintenance disturbance. This alternative crosses more streams than the Northern or Central Alternatives, and moderate impacts to riparian-dependent wildlife species would be greatest for this alternative.

NORWOOD SUBSTATION EFFECTS

Vegetation Communities and Botanical Resources. Vegetation and botanical impacts would be the same as those described for the Nucla-Norwood Northern Alternative.

Wildlife. Impacts to wildlife would be the same as those for the Northern and Central Alternatives.

69 KV TRANSMISSION LINE AND DISTRIBUTION SYSTEM EFFECTS

Vegetation Communities and Botanical Resources. Approximately 33 acres of rangeland, 68 acres of woodland, and 0.36 acre of riparian would be within the right-of-way of this alternative. Through implementation of the EPMs, impacts to the riparian communities would be low to moderate, while other vegetation communities would incur low effects overall.

Potential impacts to riparian habitats may occur at one location, a tributary to Naturita Creek at Link 1, mile marker 1.3 (BLM land). The dismantling of a majority of the existing 69 kV line could potentially impact four non-riparian streams, while the retention of one mile of the existing 69 kV line for the distribution system would continue any on-going maintenance effects to two non-riparian streams. All six of these streams occur on private property. As discussed for the Nucla-Norwood Central Alternative, the dismantling of the existing 69 kV line may result in unavoidable impacts to riparian habitat. Potential impacts to riparian habitats and the non-riparian streams could be moderate.

The potential increase in exotic species invasion that could occur from the dismantling of the existing 69 kV line would be a low impact with EPM 23 (*Tables* 2.2-4 and 2.2-5).

The potential for the occurrence of nine sensitive plant species and the level of impacts to these species from this alternative are similar to those described for the Nucla-Norwood Northern and Central alternatives (low to high on private lands).

Wildlife. Low impacts to bald eagles would be the same as for the Central Alternative. Dismantling the existing 69 kV line would cause low impacts to mule deer, elk, and forest-dependent

sensitive wildlife, and moderate impacts to riparian-dependent sensitive wildlife at one riparian stream crossing. This alternative removes the most existing line and potentially affects the greatest amount of wildlife habitats.

Norwood-Sunshine Alternative

Table 3.6-4 provides a summary of the impacts to vegetation communities from the Norwood-Sunshine Alternative. *Table 3.6-5* provides a summary of the potential effects of this alternative on wildlife known or likely to occur in the project area.

115 kV Transmission Line Effects

Vegetation Communities and Botanical Resources. Approximately 335 acres of natural vegetation communities are within the right-of-way of this alternative, including approximately 167 acres of rangelands (mostly grass/forb rangeland), 115 acres of woodlands (mostly Gambel oak and pinyon-juniper/mountain shrub mix), 47 acres of forested land (mostly aspen and Ponderosa pine/Gambel oak), and over five acres of riparian communities. The road widening impacts necessary for this alternative could affect pinyon-juniper/mountain shrub mix, grass/forb rangeland, Gambel oak, ponderosa pine/Gambel oak, and riparian communities. Through implementation of the EPMs, the potential impacts of the 115 kV transmission line and access roads on most vegetation communities and botanical resources would be low. Impacts to riparian communities would be low to moderate in degree.

Vegetation clearing within the right-of-way could affect coniferous forests that are dominated by trees that exceed 100 feet in height. The need for tree trimming and removal within the riparian habitats has been discussed for the preceding alternatives. Impacts to the riparian communities would be low to moderate with implementation of the EPMs.

Impacts to riparian habitats would occur at six locations: an unnamed stream just southeast of the Norwood Substation at Link 11, mile marker 1.1 (private land); an unnamed creek west of Beaver Creek at Link 13 mile marker 1.45 (private land); Beaver Creek at Link 13 mile marker 2.1 (BLM land); Saltado Creek at Link 13 mile marker 10.15 (private land); Fall Creek at Link 14 mile marker 1.0 (private land), and South Fork at Link 15 between mile markers 6.5 and 6.9 (USFS land). Additionally, nineteen non-riparian stream crossings, all on private land, could be impacted by the alternative. Because Tri-State is committed to implementing EPMs, the direct and indirect impacts to riparian habitats and streams in most instances could be considered low to moderate. However, there is one crossing of the South Fork along this alternative where the riparian vegetation may be too wide to span. This crossing occurs on public land and occurs at Link 15 between mile markers 6.5 and 6.9. The width of the riparian system to be traversed at this location is approximately 2,000 feet. H-frame poles, as would be used on public lands, have a maximum span width of 1,500 feet, which would not allow for the spanning of this riparian habitat; therefore, unavoidable impacts may occur.

Through implementation of EPM 23 (*Table 2.2-4*), the residual direct and indirect impacts to native plant communities from an increase in exotic species invasion would be considered low. It is anticipated that the effects on native plant species diversity within the project area from the relatively minor ground disturbance associated with this alternative would be none.

While no sensitive plant species are known to occur within the study corridor for the Norwood-Sunshine Alternative, the canyon bog-orchid is known from the South Fork just south of the Sunshine Substation. This species would have a moderate to high potential for occurrence along other stream courses within this alignment. An additional four species associated with montane conifer forests, and the nine sensitive plant species associated with

pinyon-juniper woodlands and shrublands discussed for the Nucla-Norwood alternatives, all have the potential to occur along this alternative. Where surface disturbance would occur within habitat suitable to support sensitive plants on private lands, impacts could potentially range from low to high.

Wildlife – Federally Listed. This alternative traverses suitable habitat for Mexican spotted owls in Beaver, Fall, Bear, and Bilk creeks, and the South Fork of the San Miguel River. Some of the canyons would be spanned and forest vegetation unaffected, but some forest vegetation would be cleared or topped on unspanned slopes or near the ends of spanned sections. If the habitat becomes occupied in the future a moderate impact would result from habitat loss. This alternative would affect about one third as much spotted owl habitat as the Norwood-Telluride Alternative (*Table 3.6-5*), and the potential future impact to spotted owls would be substantially less for this alternative.

The Norwood-Sunshine Alternative would cross a small section of suitable habitat for the Canada lynx in the vicinity of Ilium Valley. This alternative would consist of replacing the existing 69kV line with a new 115kV system. No identifiable impacts to lynx productivity, mortality or movement would be expected to occur from the reconstruction of the line in this locale. Fragmentation of lynx habitat would not result from the proposed powerline.

Although suitable habitat exists on the right-of-way, at two ponds on Wilson Mesa and along the South Fork of the San Miguel River, and on two ponds on Specie Mesa, no boreal toads were found during surveys conducted during the summer of 2001. There would be no impact to boreal toads.

Wildlife – Other Sensitive. This alternative traverses elk and mule deer winter habitats, and low impacts to wintering big game would occur similar to those described for the Nucla-Norwood Northern Alternative. This alternative affects about 25 percent less big game winter range than the Norwood-Telluride Alternative, and winter impacts to big game would be less for this alternative. Elk migration corridors and calving areas would also be affected by this alternative. Tri-State is committed to avoiding construction during critical seasons in these areas (EPM 55, *Table 2.2-4*) so no impacts to migrating or calving elk would occur from construction disturbance. Low impacts would occur from occasional maintenance, and the impacts would be slightly greater for this alternative than for the Norwood-Telluride Alternative because more migration and calving habitat could be affected.

Low impacts to nesting raptors and some forest-dependent sensitive wildlife species would occur for this alternative, as described for the Nucla-Norwood Southern Alternative. This alternative would affect about 60 percent less forested habitat as the Norwood-Telluride Alternative (*Table 3.6-5*), so impacts to nesting raptors and forest-dependent sensitive wildlife would be substantially less for this alternative.

Moderate impacts to riparian-dependent sensitive wildlife could occur at six stream crossings with riparian vegetation, slightly less than for the Norwood-Telluride Alternative.

SUNSHINE SUBSTATION EFFECTS

Vegetation Communities and Botanical Resources. The proposed expansion of the Sunshine Substation would directly impact approximately 0.05 acre of previously disturbed and landscaped areas; these impacts would be considered low. Though there are six sensitive plant species that potentially could occur in the vicinity of the Sunshine Substation (canyon bog-orchid, pale moonwort, showy whitlow-grass, Altai cottongrass, and Altai chickweed), none of these species are expected to occur within the area of the proposed expansion. If sensitive plants were present their numbers would likely be small; therefore, impacts at the substations would be expected to be low.

Temporary, direct impacts to vegetation communities may occur from the trampling of vegetation during the dismantling of the Oak Hill and Wilson Mesa substations. At the Oak Hill Substation the vegetation communities that could potentially be impacted include Gambel oak and agricultural fields. Grass/forb rangeland surrounds the Wilson Mesa Substation and would be the only vegetation community potentially impacted. These impacts would be low. The Specie Mesa Substation is mostly surrounded by grass/forb rangeland with some Gambel oak. Direct impacts to these vegetation communities would be low, and it is anticipated that any trampling of vegetation would only be a temporary impact and the vegetation could recover on its own. Additionally, Tri-State is committed to implementing EPMs that would minimize the effects of the proposed actions at the Oak Hill and Wilson Mesa substations.

Wildlife. Suitable habitat for Mexican spotted owls occurs within one mile of the substation. No habitat would be affected at the substation. If the habitat becomes occupied in the future, the seasonal closure on routine maintenance around nests (EPM 33, *Table 2.2-5*) would avoid disturbance to nesting owls, and no impacts to Mexican spotted owls would occur.

The substation lies within crucial winter habitats for elk and mule deer, and low impacts to these species would occur as described for the Nucla-Norwood Northern Alternative, Norwood Substation.

69 kV Transmission Line and Distribution System Effects

Vegetation Communities and Botanical Resources. The new three-phase overhead distribution lines between the Norwood and Oak Hill Substations would cross grass/forb rangeland, agriculture, and minor amounts of Gambel oak. Impacts to vegetation communities from any right-of-way vegetation clearing would be minimal, as these communities, with the exception of the Gambel oak, are low growing. Any impacts to the Gambel oak from the right-of-way clearing would also be low.

The proposed action is not anticipated to result in an increase in exotic species invasion, as most of the impacts are restricted to human-manipulated communities (*i.e.*, agriculture and grass-forb rangeland). Additionally, Tri-State is committed to implementing EPMs that would ensure that the likelihood for exotic species invasion is low. The effect on native plant species diversity within the project area associated with the 69 kV line would be none.

Surface disturbance impacts within habitat suitable to support sensitive plants on private lands could range from low to high. However, there are no known occurrences of sensitive plant species populations along the proposed new overhead distribution line, and most of the area supports grass-forb rangeland and agriculture. Sensitive plants would also not be expected to occur along the distribution system alignment.

Wildlife. The new distribution line near the Oak Hill Substation lies within elk and mule deer crucial winter habitats. Low impacts would occur as described for the Nucla-Norwood Northern Alternative.

Norwood-Telluride Alternative

Table 3.6-4 provides a summary of the impacts to vegetation communities from the Norwood-Telluride Alternative. The Norwood-Telluride Alternative would be more impactive to rangelands, woodlands, forest, and riparian communities than the Norwood-Sunshine Alternative. The total impact from the Norwood-Telluride Alternative is nearly 40 percent more than the Norwood-Sunshine Alternative. Additionally, because the Norwood-Telluride Alternative does not follow an existing 69 kV line, this alternative would also impact a larger

area of undisturbed habitat than would the Norwood-Sunshine Alternative. *Table 3.6-5* provides a summary of the potential effects of this alternative on wildlife known or likely to occur in the project area.

115 kV Transmission Line Effects

Vegetation Communities and Botanical Resources. Approximately 346 acres of natural vegetation communities would be within the right-of-way of the 115 kV transmission line alternative, including approximately 98 acres of rangeland, 110 acres of woodlands, 126 acres of forested land, and nearly 11 acres of riparian vegetation communities. Gambel oak is the most dominant woodland that would be affected by this alternative; and aspen, Douglas fir, and Douglas fir/aspen are the more dominant forested communities that would be affected. The road widening impacts of this alternative could affect pinyon-juniper/mountain shrub mix, grass/forb rangeland, Gambel oak, ponderosa pine/Gambel oak, and riparian communities. Through implementation of the EPMs, the residual impacts to riparian communities would be low to moderate. Other vegetation communities would incur low impacts.

The right-of-way vegetation clearing would impact coniferous forests, which are dominated by trees that exceed 100 feet in height. However, impacts to these forest communities (direct loss of habitat, habitat fragmentation, and edge effects) would be considered low with implementation of the EPMs. The impact from trimming/removal of trees within riparian communities would be considered low to moderate depending on site-specific conditions.

Impacts to riparian habitats could occur at nine locations: an unnamed stream just southeast of the Norwood Substation at Link 11, mile marker 1.1 (private land); an unnamed creek west of Beaver Creek at Link 13 mile marker 1.45 (private land); Beaver Creek at Link 13 mile marker 2.1 (BLM land); Saltado Creek at Link 13 mile marker 10.15 (private land); Fall Creek at Link 19 between mile markers 1.0 and 1.1 (BLM land); Bear Creek at Link 19 and mile marker 5.4 (BLM land); and three locations along the San Miguel River, between Link 19 mile marker 8.4 and Link 20 mile marker 0.5 (private land), Link 21 between mile markers 0.8 and 0.95 (BLM land), and Link 21 between mile markers 1.9 and 2.2 (private land). Additionally, there are 16 non-riparian stream crossings, all on private land that could be crossed by this alternative. With implementation of the EPMs, impacts would be low. There are two crossings of the San Miguel River where the riparian vegetation may be too wide to span, however. These two crossings are both on private lands where single poles would be used and occur: between Link 19, mile marker 8.4 and Link 20 mile marker 0.5; and, at Link 21 between mile markers 1.9 and 2.2. The width of the riparian system at these locations is 1,000 and 1,300 feet. Single poles, as are proposed to be used on private lands, have a maximum span width of 600 feet, which would not allow for the spanning of these riparian habitats; therefore, unavoidable impacts may occur.

Through implementation of EPM 23 (*Table 2.2-4*), impacts to native plant communities from an increase in exotic species invasion would be considered low. It is anticipated that the effects on native plant species diversity for this alternative would be none.

While there are no known occurrences of sensitive plant species along the Norwood-Telluride Alternative, the same 14 sensitive plant species potentially occurring on the Norwood-Sunshine Alternative have the potential to occur within the Norwood-Telluride Alternative. Where surface disturbance would occur within habitat suitable to support sensitive plants on private lands, impacts could potentially range from low to high.

Wildlife – Federally Listed. This alternative traverses suitable habitat for Mexican spotted owls in Beaver Creek, Fall Creek, and the San Miguel River Canyon. If the habitat becomes occupied in the future, habitat loss would cause a moderate impact to spotted owls as described for the Norwood-Sunshine Alternative. However, this alternative would affect about three times more

spotted owl habitat, and the potential future impact to spotted owls would be substantially greater for this alternative. Potential future impacts would be greatest in the San Miguel River Canyon where a large area of contiguous and pristine habitat exists.

Although suitable habitat exists within one-half mile of the alternative on Specie Mesa no boreal toads are present.

The Norwood-Telluride Alternative would cross suitable habitat for the Canada Lynx in the vicinity of Ilium Valley, the South Fork of the San Miguel River, and along the San Miguel River canyon. Small sections of suitable summer, winter and denning habitats occur in the vicinity of the alternative, as well as lynx travel corridors. In these locales, the Project would consist of either establishing a new 115 kV transmission line corridor, or replacing an existing distribution line with the proposed transmission line with distribution underbuilt. Potential impacts to the lynx in these areas are assessed as low, and the proposed 115 kV project would not result in adverse fragmentation of lynx habitat.

Wildlife — Other Sensitive. This alternative traverses elk and mule deer crucial winter habitats and low impacts to elk and deer would occur, similar to the Norwood-Sunshine Alternative. The Norwood-Telluride Alternative affects larger areas of crucial winter habitats, and low impacts would be greater for this alternative. Elk migration corridors and elk calving areas would also be affected by this alternative as described for the Norwood-Sunshine Alternative. The Norwood-Telluride Alternative would affect less elk migration corridor area and calving area, and low impacts to elk during these seasons would be slightly less for this alternative.

Low impacts to nesting raptors and some forest-dependent sensitive wildlife species would occur from this alternative, as described for the Norwood-Sunshine Alternative. This alternative would affect about 40 percent more forest habitat than the Norwood-Sunshine Alternative (*Table 3.6-5*), including a substantial area of unfragmented forest in the San Miguel River Canyon. Impacts would be greater for this alternative on some sensitive species and other wildlife, because construction would remove, alter, or fragment a greater amount of currently pristine forest habitat. Removal of forested habitat and placement of a transmission line within the cleared corridor could result in substantial bird collision mortality. However, through implementation of EPM 56 (*Table 2.2-4*), including location of the new line near protective rows of trees to force birds to fly over the wires, and placement of bird flight diverters on isolated spans or wire protruding above the forest canopy, the risk of avian collisions within forested areas would be reduced to a low level.

This alternative crosses nine streams with riparian vegetation, and moderate impacts would occur to riparian-sensitive wildlife, similar to those for the Norwood-Sunshine Alternative.

TELLURIDE SUBSTATION EFFECTS

Vegetation Communities and Botanical Resources. Direct impacts to vegetation communities may occur from extending the existing fenceline at the Telluride Substation. Impacts to grass/forb rangeland would be low. Impacts at the Oak Hill, Specie Mesa, and Wilson Mesa substations would be the same as described for the Norwood-Sunshine Alternative.

Through implementation of EPM 23 (*Table 2.2-4*), the likelihood for an increase in exotic species invasion at the substations would be considered low. It is unlikely that the relatively minor ground disturbance proposed would affect native plant species diversity within the project area.

While there are no known occurrences of sensitive plant species near these three substations, there is a low potential for the occurrence of sensitive plants. The Wilson Mesa Substation is surrounded by large areas of grass-forb rangeland. The Oak Hill Substation is surrounded by grass-forb rangeland with patches of aspen and Gambel oak nearby that could support several

sensitive plant species, the abajo penstemon and showy whitlow-grass being the most likely to occur, albeit their potential is low. The areas likely to be impacted from enlargement of the Telluride Substation (*i.e.*, grass-forb rangeland and urban/built up) are not likely to support sensitive species. Despite the low potential for sensitive plants to occur near the substations, where surface disturbance would occur within habitat suitable to support sensitive plants on private lands, impacts could range from low to high.

Wildlife. Suitable habitat for Mexican spotted owl occurs within one mile of both the Wilson Mesa and Telluride substations (*Table 3.6-5*). No impacts would occur to Mexican spotted owls, as described for the Sunshine Substation.

The Telluride, Wilson Mesa, and Oak Hill Substations lie within winter ranges for elk and mule deer. Low impacts from construction or maintenance would occur to elk and deer, as described for the Sunshine Substation. The Wilson Mesa Substation also lies within an elk migration corridor, and minor low impacts could occur from disturbance of migrating elk by maintenance activities.

69 kV Transmission Line and Distribution System Effects

Vegetation Communities and Botanical Resources. Approximately 135 acres of natural vegetation communities could be within the right-of-way of the distribution system including approximately 84 acres of rangeland, 16 acres of woodland, 31 acres of forested lands, and four acres of riparian. Through implementation of the EPMs, impacts to the riparian communities would be low to moderate. Other impacts to vegetation communities and botanical resources would be low. The 5.1 miles of distribution line underbuilt on the 115 kV line at Specie Mesa would not result in additional impacts beyond those described for the 115 kV line.

The installation of approximately one-half mile of new underground three-phase line connecting the Wilson Mesa system to the Specie Mesa transformers would impact mostly grass/forb rangeland and some smaller areas of aspen and ponderosa pine/Gambel oak. These impacts would be considered low.

The one-mile of distribution line to be placed underground west of the Telluride Substation is proposed to be located within an existing dirt trail (Galloping Goose Trail). By locating this segment within an existing trail the impacts would be minimized. This segment mostly coincides with aspen, Englemann spruce/aspen mix, Douglas fir/Gambel oak type and riparian communities, and some smaller amounts of grass/forb rangeland. Impacts to the upland communities would be considered low. Impacts to riparian habitats should be minimized by following the trail; however, riparian impacts could occur at a one-fourth mile segment along the San Miguel River (private land) from Link 21 at mile marker 2 to the Telluride Substation. Although Tri-State is committed to numerous EMPs that would protect riparian systems, impacts to riparian habitats from this project component in particular could be high. Additionally, one non-riparian stream on private land could be impacted. Site-specific analyses are necessary in these areas to determine the extent that impacts could be minimized or avoided.

The removal of the existing 69 kV line from the Wilson Substation to the Sunshine Substation would involve the cutting of the old poles and removal of old transmission wire. Impacts would be minimal. Most impacts would occur to grass/forb rangeland, but Gambel oak, Englemann spruce, aspen, Englemann spruce/aspen mix, Douglas fir, upland willow scrub and riparian habitats could also be affected. Impacts to riparian habitats could occur along the South Fork at Link 15 between mile marker 6.55 and 6.95 (USFS land), and at Bear Creek at Link 13, mile marker 10.15 (private land). Additionally, four non-riparian streams (all on private land) could be impacted by this action. Through implementation of the EPMs, impacts to the riparian communities would be low to moderate.

The new three-phase overhead distribution lines between the Norwood and Oak Hill Substations would impact mostly agriculture and grass/forb rangeland; impacts to these vegetation communities would be considered low. Impacts from vegetation clearing within the right-of-way for the new overhead line and that portion of the 69 kV line to be retained would be similar to those described for the Nucla-Norwood Northern Alternative. Through implementation of EPM 23 (*Table 2.2-4*), the potential for an increase in exotic species invasion would be low.

There are no known occurrences of sensitive plant species along the distribution system component of the Norwood-Telluride Alternative. The same 14 sensitive plants discussed for the 115 kV line have a potential to occur along the distribution system. If present on private lands, surface disturbance within habitat suitable to support sensitive plants could result in impacts that could range from low to high.

Wildlife. Suitable habitat for Mexican spotted owls could be affected by construction of a distribution line at Fall Creek, removal of existing line at Bear Creek, Bilk Creek, and South Fork of the San Miguel River, and underground distribution line construction near Telluride. Removal of the existing line would have no impact on Mexican spotted owls. If suitable habitat becomes occupied in the future, moderate impacts from habitat loss would occur. The underground portion would have no impact from habitat loss, because the route mostly follows an existing dirt trail.

Winter habitats for elk and mule deer coincide with the distribution line near the Oak Hill Substation, the existing 69 kV line conversion to distribution line at Fall Creek, and the Wilson Mesa underground distribution line. Low impacts to elk and deer would occur, as described for the 115 kV line. Removal of the existing 69 kV line on Wilson Mesa would occur within elk migration corridor area and calving area, but seasonal avoidance (EPM 55) will avoid impacts to elk.

3.6.2.4 IMPACTS OF THE SUBALTERNATIVES

Subalternatives A, B, C, D, and E represent minor variations of the proposed 115 kV transmission alternatives. In addition, one substation alternative (Site B) is proposed for the Norwood Substation site. *Table 3.6-6* provides a summary and comparison of the impacts to vegetation communities among the proposed subalternatives. *Table 3.6-7* provides a summary of the potential effects of implementing each subalternative on wildlife known or likely to occur in the project area.

115 kV Subalternative A

Vegetation Communities and Botanical Resources. Subalternative A would be slightly more impactive on the vegetation communities and botanical resources than the Nucla-Norwood Southern Alternative. Both Subalternative A and the Nucla-Norwood Southern Alternative would cross McKee Draw and Naturita Creek; however, because this subalternative would effectively follow the contours of the canyon slopes into Naturita Canyon versus spanning the canyon from rim to rim, the potential for impacts to riparian habitat is greater.

Nearly 20 acres of woodlands, 1.5 acres of forest, and 0.26 acre of riparian habitat would be within the right-of-way of Subalternative A (*Table 3.6-6*). Impacts to riparian habitat would occur along Naturita Creek on BLM land at Link 6, mile marker 9.5. Additionally, one non-riparian stream on BLM land would be crossed at Link 6, mile marker 8.7. Because Tri-State is committed to implementing relevant EPMs, impacts should be low. However, unavoidable impacts to Naturita Creek from following the contours of the adjacent slopes could lead to impacts considered moderate at this location.

Impacts from the potential increase in exotic species invasion and right-of-way vegetation clearing, and the potential for the occurrence of, and impacts to, sensitive plant species would be the same as those described for the 115 kV Transmission Line for the Nucla-Norwood Southern Alternative.

Wildlife. This alternative crosses suitable habitat for Mexican spotted owls, and ground disturbance impacts would be greater compared to the Southern Alternative. If the habitat becomes occupied in the future, a moderate impact from habitat loss and low impact from bird collision would occur, and the impacts on Mexican spotted owls would be greater compared to the Southern Alternative.

Table 3.6-6
Potential Impacts to Vegetation Communities and Land Cover Types from the Nucla-Telluride Transmission Line Project Subalternatives

Vegetation Communities	115kV Transmission Line					Norwood Substation Alt. B (Acres)
	Sub. A (Acres)	Sub. B (Acres)	Sub. C (Acres)	Sub. D (Acres)	Sub. E (Acres)	
Rangeland						
Grass/Forb Rangeland (GRF)	0.00	2.09	6.31	5.24	4.22	3.39
Rangeland Totals	**0.00**	**2.09**	**6.31**	**5.24**	**4.22**	**3.39**
Woodland						
Pinyon-Juniper (PJN)	5.99	1.89	0.00	0.00	0.00	0.00
Gambel Oak (GOK)	0.00	0.00	0.00	0.22	0.00	0.00
Mountain Shrub Mix (MSX)	0.00	0.00	0.19	0.00	0.00	0.27
Pinyon-Juniper/Sagebrush Mix (PSX)	5.16	0.53	1.02	0.00	0.00	0.17
Pinyon-Juniper/Mountain Shrub Mix (PMX)	8.72	12.18	21.83	0.00	0.00	7.44
Woodland Totals	**19.87**	**14.60**	**23.04**	**0.22**	**0.00**	**7.88**
Forest Land						
Douglas Fir (DFR)	0.00	0.00	0.00	0.00	3.79	0.00
Ponderosa Pine/Douglas Fir Mix (PDX)	0.00	0.00	0.00	0.00	0.34	0.00
Douglas Fir/Gambel Oak Type (DFG)	1.51	0.00	0.00	0.00	0.00	0.00
Douglas Fir/Aspen Mix (DFA)	0.00	0.00	0.00	0.00	0.07	0.00
Forest Land Totals	**1.51**	**0.00**	**0.00**	**0.00**	**4.20**	**0.00**
Riparian						
Riparian (RIP)	0.26	0.00	0.00	0.00	3.94	0.00
Riparian Totals	**0.26**	**0.00**	**0.00**	**0.00**	**3.94**	**0.00**
Subtotal of Impacts to the Natural Vegetation Communities	**21.64**	**16.69**	**29.35**	**5.46**	**12.36**	**11.27**
Other Land Cover Types						
Agriculture (AGR)	0.00	5.84	0.00	14.03	0.00	0.00
Subtotal of Impacts to Other Land Cover Types	**0.00**	**5.84**	**0.00**	**14.03**	**0.00**	**0.00**
Total Impacts from the Proposed Project	**21.64**	**22.53**	**29.35**	**19.49**	**12.36**	**11.27**

Low impacts to elk and mule deer, nesting raptors, and forest-dependent sensitive wildlife would occur, and impacts would be greater for this alternative because of increased construction and maintenance activity within the canyon, and larger area of altered forest habitat. For the same reasons, moderate impacts to riparian-dependent sensitive species would be greater compared to the Southern Alternative.

Table 3.6-7
Potential Impacts to Sensitive Wildlife from the Nucla-Telluride Transmission Line Project Subalternatives

Sensitive Resource	Subalternative	Portion of Primary Alternative to be replaced by Subalternative
115kV Subalternative A		
Mexican spotted owl – indirect impacts from disturbance	No Identifiable Effect	No Identifiable Effect
Mexican spotted owl – direct loss of habitat	Greater moderate impact if spotted owls were present, 7 acres of suitable habitat within ROW, more tree clearing or topping.	Lesser moderate impact if spotted owls were present, 7 acres of suitable habitat within ROW, less tree clearing or topping.
Mexican spotted owl – mortality through collisions	Greater low impact if spotted owls were present, 0.5 mile of line in suitable habitat, mostly close to or within canopy.	Lesser low impact if spotted owls were present, 0.5 mile of line in suitable habitat, mostly span above canopy.
Other raptors – indirect impacts from disturbance at nest sites.	Low during maintenance	Low during maintenance
Other raptors – direct loss of habitat.	Greater low impact. Some disturbance to 7 acres of forest within 100-foot ROW.	Lesser low impact. Minimal disturbance to 7 acres of forest within 100-foot ROW.
Other forest-dependent sensitive wildlife – habitat loss, disturbance, or mortality	Greater low impact. Some disturbance to 7 acres of forest within 100-foot ROW.	Lesser low impact. Minimal disturbance to 7 acres of forest within 100-foot ROW.
Other riparian-dependent sensitive wildlife – disturbance or mortality	Greater moderate impact. Low span over 1 riparian stream crossing.	Lesser moderate impact. High span over 1 riparian stream crossing.
115 kV Subalternative B		
Elk – indirect impacts from disturbance in winter range (WR).	Greater low impact in winter. 3,790 acres of WR within 1 mile of ROW.	Lesser low impact in winter. 3,350 acres of WR within 1 mile of ROW.
Elk – indirect impacts from disturbance in winter concentration area (WCA).	Greater low Impact during maintenance. 1,318 acres of WCA within 1 mile of ROW.	Lesser low Impact during maintenance. 880 acres of WCA within 1 mile of ROW.
Mule deer – indirect impacts from disturbance in winter range (WR).	Greater low impact in winter. 3,790 acres of WR within 1 mile of ROW.	Lesser low impact in winter. 3,350 acres of WR within 1 mile of ROW.
Mule deer – indirect impacts from disturbance in winter concentration area (WCA).	Greater low impact in winter. 1,816 acres of WCA within 1 mile of ROW.	Lesser low impact in winter. 1,377 acres of WCA within 1 mile of ROW.
115 kV Subalternative C		
Elk – indirect impacts from disturbance in winter range (WR).	Greater low Impact in winter. 3,153 acres of WR within 1 mile of Subalternative ROW.	Lesser low impact in winter. 2,917 acres of WR within 1 mile of ROW.
Elk – indirect impacts from disturbance in winter concentration area (WCA).	Greater low Impact during maintenance. 53 acres of WCA within 1 mile of ROW.	Lesser low Impact during maintenance. 32 acres of WCA within 1 mile of ROW.
Mule deer – indirect impacts from disturbance in winter range (WR).	Greater low impact in winter. 3,153 acres of WR within 1 mile of Subalternative ROW.	Lesser low impact in winter. 2,917 acres of WR within 1 mile of ROW.
Mule deer – indirect impacts from disturbance in winter concentration area (WCA).	Greater low Impact during maintenance. 452 acres of WCA within 1 mile of ROW.	Lesser low Impact during maintenance. 407 acres of WCA within 1 mile of ROW.
115 kV Subalternative D		
Elk – indirect impacts from disturbance in winter range (WR).	Low impact in winter. 3,318 acres of WR within 1 mile of ROW.	Low impact in winter. 3,205 acres of WR within 1 mile of ROW.
Elk – indirect impacts from disturbance in severe winter range (SWR).	Low impact during maintenance. 1,206 acres of SWR within 1 mile of ROW.	Low impact during maintenance. 1,200 acres of SWR within 1 mile of ROW.
Mule deer – indirect impacts from disturbance in winter range (WR).	Low impact in winter. 2,003 acres of WR within 1 mile of ROW.	Low impact in winter. 2,007 acres of WR within 1 mile of ROW.

Table 3.6-7 **Potential Impacts to Sensitive Wildlife from the Nucla-Telluride Transmission Line Project Subalternatives**		
Sensitive Resource	**Subalternative**	**Portion of Primary Alternative to be replaced by Subalternative**
Mule deer – indirect impacts from disturbance in severe winter range (SWR).	Low impact during maintenance. 1,206 acres of SWR within 1 mile of ROW.	Low impact during maintenance. 1,200 acres of SWR within 1 mile of ROW.
115 kV Subalternative E		
Mexican spotted owl – indirect impacts from disturbance	No Identifiable Effect	No Identifiable Effect
Mexican spotted owl – direct loss of habitat	Moderate impact. 6 acres of suitable habitat within ROW.	Moderate impact. 6 acres of suitable habitat within ROW.
Mexican spotted owl – mortality through collisions	Low* impact. 0.5 mile of line traverses suitable habitat.	Low* impact. 0.5 mile of line traverses suitable habitat.
Elk – indirect impacts from disturbance in winter range (WR).	Low impact in winter. 4,319 acres of WR within 1 mile of ROW.	Low impact in winter. 4,319 acres of WR within 1 mile of ROW.
Elk – indirect impacts from disturbance in winter concentration area (WCA) and severe winter range (SWR).	Low impact during maintenance. 1,162 acres of WCA and 3,129 acres of SWR within 1 mile of ROW.	Low impact during maintenance. 1,191 acres of WCA, and 3,129 acres of SWR within 1 mile of ROW.
Mule deer – indirect impacts from disturbance in winter range (WR).	Low impact in winter. 4,319 acres of WR within 1 mile of ROW.	Low impact in winter. 4,319 acres of WR within 1 mile of ROW.
Mule deer – indirect impacts from disturbance in winter concentration area (WCA) and severe winter range (SWR).	Low impact during maintenance. 2,299 acres of WCA and 3,127 acres of SWR within 1 mile of ROW.	Low impact during maintenance. 2,299 acres of WCA, and 3,127 acres of SWR within 1 mile of ROW.
Other raptors – indirect impacts from disturbance at nest sites.	Low during maintenance	Low during maintenance
Other raptors – direct loss of habitat.	Low impact. Disturbance to 6 acres of forest within 100-foot ROW.	Low impact. Disturbance to 6 acres of forest within 100-foot ROW.
Other forest-dependent sensitive wildlife – habitat loss, disturbance, or mortality	Low impact. Disturbance to 6 acres of forest within 100-foot ROW.	Low impact. Disturbance to 6 acres of forest within 100-foot ROW.
Other riparian-dependent sensitive wildlife – habitat loss, disturbance, or mortality	Moderate impact. 0.25 acre of riparian vegetation community within Subalternative ROW.	Moderate impact. 0.25 acre of riparian vegetation community within ROW.
Norwood Substation – Alternative Site B		
Elk – indirect impacts from disturbance in winter range (WR).	Greater low impact in winter. 3,330 acres of WR within 1 mile of existing unenlarged Norwood Substation and substation site B.	Lesser low impact in winter. 2,057 acres of WR within 1 mile of existing Norwood Substation (enlarged to 2 acres).
Elk – indirect impacts from disturbance in winter concentration area (WCA).	Greater low impact during maintenance. 795 acres of WCA within 1 mile of existing Norwood Substation (not enlarged to 2 acres) and substation site B.	Lesser low impact during maintenance. 676 acres of WCA within 1 mile of existing Norwood Substation (enlarged to 2 acres).
Mule deer – indirect impacts from disturbance in winter range (WR).	Greater low impact in winter. 3,303 acres of WR within 1 mile of existing Norwood Substation (not enlarged to 2 acres), and substation site B.	Lesser low impact in winter. 2,057 acres of WR within 1 mile of existing Norwood Substation (enlarged to 2 acres).
Mule deer – indirect impacts from disturbance in winter concentration area (WCA).	Greater low during maintenance. 1,303 acres of WCA within 1 mile of existing Norwood Substation (not enlarged to 2 acres), and substation site B.	Lesser low impact during maintenance. 711 acres of WCA within 1 mile of existing Norwood Substation (enlarged to 2 acres).

115 kV Subalternative B

Vegetation Communities and Botanical Resources. Impacts to the vegetation communities from this subalternative (mostly pinyon-juniper/mountain shrub mix) would be low. However, Subalternative B would be more impactive than the primary routing of the 115 kV line. By routing away from the 69 kV alignment, Subalternative B would likely impact more undisturbed habitat. Impacts along the primary route would also occur from this subalternative as the old 69 kV line would need to be dismantled.

The need for tree trimming or removal along this subalternative is expected to be minimal to none. Therefore, the effects of right-of-way maintenance would be low. The potential for an increase in exotic species invasion would also be low due to Tri-State's commitment to EPM 23 (*Tables 2.2-4* and *2.2-5*).

No sensitive plant species are known to occur within the vicinity of Subalternative B. However, if present, impacts to sensitive plants could range from low to high depending upon the number and size of population(s) impacted, relative to known occurrences.

Wildlife. Because this subalternative crosses a greater linear distance of elk and mule deer crucial winter habitat, low impacts on elk and deer would be slightly greater than those reported for the primary alternatives.

115 kV Subalternative C

Vegetation Communities and Botanical Resources. Impacts to the vegetation communities (mostly pinyon-juniper/mountain shrub mix) would be low. Subalternative C would be more impactive than the primary routing of the 115 kV line, for the same reasons discussed above for Subalternative B. The potential for an increase in exotic species invasion, potential impacts associated with tree-trimming within the right-of-way, and the potential for the occurrence of, and impacts to, sensitive plant species would also be the same as those described for Subalternative B above.

Wildlife. Impacts would be the same as those described for Subalternative B.

115 kV Subalternative D

Vegetation Communities and Botanical Resources. Impacts to the vegetation communities that coincide with this subalternative (grass/forb rangeland, oak, and agriculture) would be considered low and similar to those described above for Subalternative B. Similarly, the potential for an increase in exotic species invasion, potential impacts associated with tree-trimming within the right-of-way, and the potential for the occurrence of, and impacts to, sensitive plant species would be the same as described for Subalternative B.

Wildlife. The subalternative lies within elk and mule deer crucial winter ranges, and low impacts to elk and deer would be similar to the primary alternative.

115 kV Subalternative E

Vegetation Communities and Botanical Resources. Subalternative E would impact approximately ten percent more habitat than the Norwood-Telluride Alternative. Both would impact relatively undisturbed habitat, but Subalternative E could have up to four crossings of the San Miguel River, where the primary route would have only one. Approximately four acres of rangeland, four acres of forest land, and nearly four acres of riparian would be within the right-of-way of this alternative. (*Table 3.6-6*). Through implementation of the EPMs, impacts to the riparian communities would be low to moderate, while other vegetation communities would be impacted to a low degree.

Impacts to riparian habitats could occur at four locations along the San Miguel River, all of which are on private land and within Link 22: mile markers 0 to 0.2; mile markers 0.3 to 0.4; mile marker 0.9; and, at the confluence of the San Miguel River and Bilk Creek at mile marker 0.5. Only at the latter two locations would riparian habitat be crossed (*e.g.*, at the crossing of Bilk Creek at mile marker 0.5 and at the eastern terminus of this subalternative where it crosses the San Miguel River). At the other two locations (mile markers 0 to 0.2 and mile markers 0.3 to 0.4), the subalternative alignment is immediately adjacent to riparian habitat; impacts at these two areas are likely to be easily avoidable. Because Tri-State is committed to the EPMs, the residual direct and indirect impacts to riparian habitats and streams should be low. However, there is one crossing of the San Miguel River along this subalternative where the riparian vegetation is likely too wide to span. This crossing occurs on private land, where single poles are proposed to be used, and occurs at Link 22 from mile marker 0 to approximately mile marker 0.15. The width of the riparian system to be traversed at this location is approximately 800 feet. Single poles (with a maximum span width of 600 feet) would not allow for the spanning of this riparian habitat; therefore, impacts may be unavoidable. Similarly, the proposed clearing of vegetation within the right-of-way could result in unavoidable impacts to riparian trees, especially mature cottonwoods. Removal of mature riparian tree species from the right-of-way as part of initial and ongoing maintenance activities could result in moderate impacts.

Overall, vegetation clearing and removal within the right-of-way would be more extensive for this subalternative than the Norwood-Telluride Alternative because of the large expanses of coniferous forests, which are dominated by trees that exceed 100 feet in height. Clearing within the riparian habitats is discussed above, impacts to all other vegetation communities would be considered low.

The potential for an increase in exotic species invasion would be low with implementation of EPM 23. No sensitive plant species are known to occur within the vicinity of Subalternative E. However, if present, impacts to sensitive plants could range from low to high depending upon the number and size of population(s) impacted, relative to known occurrences.

Wildlife. Because this alternative more closely approaches the San Miguel River, moderate impacts to riparian-dependent sensitive wildlife are greater for this subalternative compared to the Norwood-Telluride Alternative. Other wildlife impacts would be the same as the Norwood-Telluride Alternative.

Underground Subalternative

The Underground Subalternative would physically disturb vegetation and wildlife habitat along the entire length of the right-of-way. Vegetation would be physically removed along the five-foot-wide trench (approximately 6.0 acres). Other vegetation along the 40-foot wide construction corridor may be physically damaged by construction equipment. The trench would primarily impact grass/forb and sagebrush/grass rangeland. Some Ponderosa pine/Gambel oak, Englemann spruce, Englemann spruce/aspen mix, Douglas fir/Gambel oak, upland willow scrub, and pinyon-juniper sagebrush mix would also be removed. As noted in Section 3.5, the Underground Subalternative would also cross a number of drainages and irrigation ditches where direct impacts to small amounts of wetlands and riparian habitats could also occur. The trench would also physically disturb potential habitat for the boreal toad. Impacts to vegetation communities are assessed as less than significant. Potential effects to boreal toads are assessed as moderate. The trench would traverse elk winter concentration, winter range and migration corridor areas on Wilson Mesa. With EPM 54, impact to these wildlife areas would be low.

With respect to the potential impacts of the underground subalternative on wetlands, a survey was conducted in September 2001 to identify if any fen wetlands are within a 300-foot wide

survey corridor centered on the existing 69 kV transmission line (BIOLogic September 2001). Four types of wetlands are found in Colorado: peatland, marsh, wet meadow and riparian (CDOW 2000). Fens are considered 'peatlands' and are the only type of peatlands found in Colorado. Fens are montane wetlands, and in Colorado are generally found at elevations above 8,000 feet in glacial landforms such as depressions. Due to their unique characteristics, fens perform unique hydrological functions and support unique biotic assemblages or ecological communities not found in other types of wetlands. The protection and conservation of fens is considered a priority by Region 6 of the U.S. Fish and Wildlife Service (USFWS), the Environmental Protection Agency (EPA), and the Colorado Division of Wildlife (CDOW). Functioning fens are defined as those that continue to support native plant communities and perform functions inherent to fens, or have potential to rapidly recover those functions upon the removal or rectification of impacts.

The majority of wetlands within 150 feet of the existing 69 kV transmission line are riparian wetlands, found along major and minor drainages including drainages of the South Fork of the San Miguel River, Specie Creek, tributaries to Big Bear Creek, Muddy Creek and Huff Gulch. General locations of wetlands are shown in ***Figure BIO-1***. One fen wetland was identified on Wilson Mesa and is crossed by the 69 kV line. The fen appears to be a functionally marginal fen, in that no evidence of unique plants or animal species was observed within the fen. The following biologically sensitive wetlands and riparian vegetation were identified by BIOLogic, Inc. within 150 feet of the existing transmission line across each of the mesas:

Beaver Mesa – an area at Huff Gulch, that is characterized by aspen and cottonwood along a narrow riparian wetland within the floodplain. Area is constrained by rock outcrops.

Specie Mesa – 1) a riparian wetland with willows and reedgrass that parallels an unnamed drainage along P52 road (near Link 13, mile marker 10.7); 2) a small potential wet meadow, vegetated with shrubby cinquefoil and a few sedges, associated with Hughes Ditch, between Specie and Fall Creeks; and 3) a small marsh wetland used by waterfowl, upstream of a bermed pond (near Link 13, mile marker 13.2).

Wilson Mesa – 1) Muddy Creek that is characterized by a narrow riparian wetland less than 100 feet wide, that is constrained by rock outcrops and vegetated with scattered willows, grasses and sedges; 2) a fen wetland located just west of 60M Road; (Link 15, mile marker 3.1). This fen wetland is approximately 300 to 400 feet in length and varies in width from 50 to 200 feet; 3) a wetland located just east of 60M Road; and 4) a riparian wet meadow further east of 60M road (near Link 15, mile marker 5.4).

Sunshine Mesa – an area, characterized as a wet meadow wetland near Link 15, mile marker 5.9. (BIOLogic, 2001)

Potential direct impacts to most wetlands could be avoided through final design and location of the trench and construction corridor. Relocation of the right-of-way would be necessary to avoid direct impacts to the fen wetland on Wilson Mesa. Measures to avoid or minimize impacts to wetlands may entail directional drilling (see Appendix A-5). With implementation of the EPMs, impacts are assessed as moderate and less than significant.

The Underground Subalternative would have beneficial effects to sensitive wildlife by eliminating perching possibilities for raptors. Although the transmission poles would be made as "perch-proof" as possible, the potential for raptor perching and predation still remains. In particular, the underground subalternative would have beneficial effects to known sage grouse leks and on sage grouse overall range on Beaver Mesa (see ***Plate BIO-2***).

Norwood Substation Alternative Site B

Vegetation Communities and Botanical Resources. The Norwood Substation Alternative Site B would have greater impacts than enlarging the existing Norwood Substation. Though the difference in impact from developing Site B versus enlarging the existing site would be slight, an additional 11 acres would be affected from extending SMPA's existing distribution to Substation Site B. Additional impacts would arise from this subalternative due to the dismantling of the existing Norwood Substation.

Substation Site B would impact approximately three acres of grass/forb rangeland and nearly eight acres of woodlands (*Table 3.6-6*). Impacts to these vegetation communities would be considered low. Temporary, direct impacts to vegetation communities may occur from the trampling of vegetation during the dismantling of the Norwood Substation. These impacts would be considered low. Impacts from the potential increase in exotic species invasion, and potential impacts to sensitive plant species would be the same as those described for Subalternative B.

Wildlife. Construction of the substation would remove two acres of elk winter range and mule deer winter concentration area. Low impacts would result to elk and mule deer similar to those described for the standard substation alternative, along with potentially greater cumulative impacts with other development in crucial winter ranges in the area.

3.6.2.5 CUMULATIVE EFFECTS

Vegetation Communities and Botanical Resources. The timber burns and sales, residential development near Norwood and on Wilson and Specie Mesas, together with recreational trails and facilities planned at the Galloping Goose Trail and along the San Miguel River, would reduce the available area of native vegetation communities and fragment the existing habitat. However, it is not anticipated that the cumulative impacts of these projects, together with the proposed transmission line project, would result in an impact level more severe than analyzed for the transmission line alone. Large contiguous tracts of all habitats would remain on private lands and on USFS and BLM managed lands.

Similarly, cumulative impacts to sensitive plant species, if present and if disturbed by the future projects, could range from low to high depending upon the number and size of population(s) impacted, relative to known occurrences. Because all potential impacts to sensitive plant species would need to be reviewed and approved by the resource agencies, and if needed, compensatory mitigation provided, it is not anticipated that cumulative impacts to sensitive plants would be cumulatively significant.

Wildlife. Impacts of the proposed timber burns would be low or none on listed or sensitive wildlife species. None of the other potential future development, together with the proposed Project, would lead to cumulative impacts to wildlife greater than already discussed for the Nucla-Telluride Transmission Line project.

Proposed timber sales could result in significant reduction of mature aspen or mature coniferous forest, resulting in impacts to forest-dependent sensitive species such as northern goshawk, pygmy nuthatch, and olive-sided flycatcher. Similarly, residential development in the eastern portion of the project area on Wilson and Specie mesas may result in some additional loss or fragmentation of forest habitat. The Norwood-Telluride 115 kV Alternative would result in loss and fragmentation of existing aspen and coniferous forest habitat, causing an adverse cumulative impact in association with timber sales and residential development in the area. However, because of the small extent of timber sales, their distance from the project area, and the relatively dispersed nature of projected residential development with significant open space remaining in natural vegetation, it is not expected that cumulative

wildlife impacts from forest habitat loss would increase the overall effect of this impact over that analyzed for the transmission line project alone.

Residential development in non-forested habitats near Norwood may result in loss of habitat for some sensitive species such as loggerhead shrike and purple martin, and may reduce available winter habitat for elk and mule deer. It is not expected that implementation of any of the project alternatives would lead to cumulatively severe impacts of habitat loss in unforested habitats.

Residential development near Norwood and on Wilson and Specie Mesas, along with recreational trails and facilities planned at the Galloping Goose Trail and along the San Miguel River, may adversely impact wildlife through disturbance. Impacts could occur to wintering bald eagles and wintering elk and mule deer on Wrights Mesa, elk calving and migration in and near Wilson Mesa, Mexican spotted owls and southwestern willow flycatchers, if potential habitat becomes occupied in the San Miguel River canyon and tributary canyons east of Specie Mesa, and, locally, to many other sensitive wildlife species during breeding or nesting seasons. Cumulative impacts to these wildlife species could occur from implementation of any of the transmission line project alternatives requiring future maintenance activity. The Norwood-Telluride 115 kV Alternative would have the greatest cumulative disturbance impacts to listed species, if future habitat becomes occupied as described for the project alternatives. However, it is not anticipated that cumulative impacts of any of the project alternatives together with the potential future development would be at an impact level more severe than impacts analyzed for the proposed Project alone.

3.6.2.6 POTENTIAL MITIGATION MEASURES AND RESIDUAL EFFECTS

Tri-State is committed to numerous EPMs (*Tables 2.2-4* and *2.2-5*) which would reduce or eliminate many impacts on the biological resources within the project area. Through incorporation of the EPMs, the majority of potential project-related impacts have been reduced, and many of the potential impacts have been avoided. In this section, additional measures that would further reduce impacts are described. Additional measures may also result from formal consultation with the USFWS if the Project would potentially affect listed species.

Wetlands and streams - Federal regulations and USFS and BLM best management practices require that impacts to wetlands, streams, and riparian areas are avoided, or minimized to the greatest extent feasible. Tri-State is committed to EPMs that should ensure that such impacts are avoided or minimized. For unavoidable impacts, compensatory mitigation would be provided and mitigation plans would be reviewed and approved by the resource agencies. Only site-specific assessment of areas where potential impacts would occur would determine the final level of impact. Numerous riparian and stream crossings have been identified among the alternatives. Additional mitigation at four of these crossings would further reduce or avoid impacts as noted below:

Norwood-Sunshine Alternative - For the one crossing of the South Fork on public land where the riparian system may be too wide (2,000 feet) to span using the proposed H-frame poles, it is recommended that either an alternative pole type that would allow a greater span be used, or, if placement of poles within the riparian system is unavoidable, that the method for traversing this riparian system be reviewed and approved by a qualified biologist in consultation with the resource agencies.

Norwood-Telluride Alternative - For the two crossings of the San Miguel River on private land where the riparian system may be too wide (1,000 and 1,300 feet) to span using single poles, it is recommended that H-frame poles with a maximum span width of 1,500 feet be used. The H-frame poles should be placed outside of, and sufficiently away from, the riparian system to avoid all direct and indirect impacts to these riparian areas.

Subalternative E - For the one crossing of the San Miguel River on private land where the riparian system may be too wide (800 feet) to span using single poles, it is recommended that H-frame poles with a maximum span width of 1,500 feet be used. The H-frame poles should be placed outside of, and sufficiently away from, the riparian system to avoid all direct and indirect impacts to these riparian areas.

Underground Subalternative – Impacts to sensitive riparian vegetation and wetlands should be avoided to the greatest extent possible. Mitigation measures to be considered include rerouting the right-of-way to avoid small wetlands and confining construction areas to avoid impacts. In instances where rerouting is not feasible, directional drilling is recommended to avoid or minimize impacts.

Sensitive plant species - Because Tri-State would implement EPM 31 (*Table* 2.2-5) on federally managed lands, no further mitigation for the potential impact to sensitive species on these portions of the Project is needed. However, for all segments of the Project that traverse privately owned land, the following mitigation measures are recommended to reduce the level of potential impacts to sensitive plant species from potentially high to low. Sensitive plant surveys should be conducted prior to any construction where project-related surface disturbance would occur within habitat suitable for the 14 sensitive plant species identified for this Project. These surveys should be conducted throughout the proposed area of impact at all the pole locations, road widening areas, spur roads to pole sites, equipment staging areas, equipment construction areas, helicopter drop zones, pre-defined overland construction routes, substation expansion areas, and areas proposed for the right-of-way tree trimming. Surveys should be conducted by qualified biologists during the optimal period for each sensitive plant species when positive identification can be determined (e.g., the blooming period). This may necessitate more than one survey in a given area to account for different blooming cycles for the species of concern. If any populations of sensitive plant species are present within any of the aforementioned areas, and/or other additional areas deemed to be impacted, Tri-State should relocate structures or disturbances, wherever possible, to avoid or minimize the impact. Impacts to vegetation may also be minimized for the underground subalternative by following the Stock Drive Road across Specie Mesa.

Bald eagle - To ensure that construction does not degrade bald eagle habitat by tree clearing or topping, prior to construction a qualified biologist should assess all 115 kV line or distribution line to be constructed within the bald eagle winter daytime concentration area. If important day roost or hunting perch trees are within the right-of-way, the biologist should consult with project engineers to seek feasible alternatives to tree removal or topping.

Bird collisions - To assure that appropriate design measures to reduce the risk of bird collisions are incorporated at locations where bird collision risk is highest along the alignment (e.g., canyon crossings, forested areas, and adjacent to riparian systems), a qualified biologist should review design plans and consult with the project engineers to minimize bird mortality and assure that collision impacts are low.

Gunnison sage grouse - To reduce the potential impact of increased avian predation on sage grouse from raptors perching on transmission line structures, single-pole and perch-proofed structures are recommended for any new construction within sage grouse winter range south of Naturita. To reduce potential impacts to Gunnison sage grouse occupying Beaver Mesa year-round, underground construction of the 115 kV line is recommended within sage grouse overall range. In addition, it is recommended that no scheduled maintenance occur within two miles of the lek during the lek attendance season (March 15 to May 31), and within one mile of nesting habitat during the nesting season (April 15 to July 15).

Elk and mule deer - To further reduce the low impact to elk and mule deer from winter disturbance by construction, it is recommended that construction activities be avoided in elk and mule deer winter range between December 15 and April 15.

Riparian-dependent wildlife - To reduce moderate impacts to riparian-dependent wildlife, a qualified biologist should review design plans, field assess all riparian and wetland habitats, and consult with project engineers to minimize animal mortality and impacts to vegetation and other structural habitat characteristics of riparian areas. This measure would reduce moderate impacts to riparian-dependent sensitive wildlife to low.

3.6.2.7 IMPACTS OF THE GENERATION ALTERNATIVES

Development of a Distributed Generator Alternative would result in the physical removal of vegetation and wildlife habitat at the generator site (approximately 1 to 3 acres). In addition, direct physical impacts could result to vegetation and wildlife habitats from the extension of the natural gas pipeline, and from modifications to the transmission, substation and distribution system that would still be necessary. Depending on the location of a generator site, impacts to riparian habitats may result in order to connect to the existing natural gas pipeline. Potential impacts to riparian habitats are considered high. The specific biological impacts resulting from the site development and connection to the natural gas pipeline would vary depending on the site location and cannot be determined at this time.

With respect to the transmission, substation and distribution system modifications that would need to occur with a generator alternative, biological impacts would be the same as described previously for the Nucla-Norwood Alternatives. With the Small Generator Scenario, impacts along the Norwood-Sunshine Line would also still result, as well.

3.6.2.8 NO ACTION ALTERNATIVE

Under the No Action Alternative SMPA would be required periodically to maintain the existing 69 kV transmission line. Such activities would generally involve replacing poles and wire along various segments of the line. Existing roads would be used for equipment and crew transportation.

Impacts to vegetation communities and sensitive plant and animal species would be similar to those described for the 115 kV Transmission Line Effects for the Nucla-Norwood Northern and the Norwood-Sunshine Alternatives. The proposed 115 kV line of the Nucla-Norwood Northern and Norwood-Sunshine Alternatives follows the existing 69 kV line. Impacts associated with maintaining the existing 69 kV line would mimic the activities of constructing the Nucla-Sunshine 115 kV line but on a much smaller scale, within a much more restricted area at any given period of time, and the impacts would be extended over a much greater period of time. There is also the potential for a relatively higher amount of emergency repair requirements associated with an older line than with a newly constructed line. The need for emergency repairs could happen at any time of the year, therefore, there is a likelihood that conflicts with critical seasons (*i.e.*, breeding season) for sensitive species could arise. Because SMPA's future maintenance activities on the existing 69 kV line are not a component of the proposed Project, no mitigation is addressed for the potential impacts associated with these future impacts. The construction and operation of the DG Alternative could also directly impact lynx habitat, and indirectly impact both lynx and Mexican spotted owl, since suitable habitat for both of these species occurs in Ilium Valley.

Noise from the operation of a generator and from increased traffic and human activity at and near the generator site, as well as facility lighting, could adversely indirectly affect lynx that may migrate through Ilium Valley, and Mexican spotted owl that could occupy this area by causing habitat avoidance. For Mexican spotted owl, a potential indirect impact to owls that could occupy this area may also include decreased reproductive success, depending on the magnitude of the indirect impacts. A potential direct impact to individuals of lynx that may migrate through Ilium Valley could occur via road kills from increased vehicle traffic in and near the generator site.

3.7 CULTURAL RESOURCES

ISSUES: Cultural resources are fragile and nonrenewable remains of prehistoric and historic human activities, occupations or endeavors. Within the project area, prehistoric cultural resources are most often found in "high sensitivity" areas characterized by pinyon and juniper stands on the edges of sagebrush openings; near canyon rims, in association with permanent water, drainage terraces, rim overhangs and/or ridgetops. Historic cultural resources are usually associated with historic mining activities and areas of intensive agricultural settlement in historic times. Issues raised during scoping included protecting cultural resources through careful surveys and mitigation measures, as well as designing research plans to add to the body of knowledge regarding this region.

3.7.1 AFFECTED ENVIRONMENT

Cultural resources are defined as fragile and nonrenewable remains of prehistoric and historic human activity, occupation, or endeavor as reflected in districts, sites, structures, buildings, objects, artifacts, ruins, works of art, architecture, and natural features that were of importance in human history. Cultural resources comprise the physical remains themselves, the areas where significant human events occurred even if evidence of the event no longer remains, and the environment surrounding the actual resource. Because of the sensitive nature of cultural resources, the technical report for this Project is on file at the Forest Service and the Office of Archaeological and Historic Preservation (OAHP).

Significant cultural resources are defined as those listed on, or eligible for listing on, the National Register of Historic Places (NRHP). Significant cultural resources are generally at least 50 years old and meet one or more of the criteria presented in 36CFR60, which specifies that the quality of significance in American history, architecture, archaeology and culture is present in districts, sites, buildings, structures, and objects of state and local importance that possess integrity of location, design, setting, materials, workmanship, feeling and association, and (a) that are associated with events that have made a significant contribution to the broad patterns of our history; or (b) that are associated with the lives of persons significant in our past; or (c) that embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or (d) that have yielded, or may be likely to yield, information important in prehistory or history.

Prehistoric cultural resources are generally evaluated with respect to criterion (d), which pertains to a site's potential for yielding scientifically valuable information. The measure of the importance of the scientific data is based upon research questions widely recognized as appropriate by the scientific community. Sites most likely to yield these important data are those with intact cultural deposits, where artifacts and features are relatively undisturbed. In addition to retaining contextual integrity, sites with the highest research value are those likely to contain cultural features. Features such as hearths, storage or habitation structures, or living surfaces often yield charcoal for radiocarbon dating, macrobotanical, palynological, and faunal evidence of subsistence practices, and associated datable assemblages. Sites with artifacts diagnostic of a particular temporal period or cultural group are also regarded as having higher research potential than those lacking diagnostic artifacts. Sites attributable to a specific unit can be used to address specific research questions and are regarded as important resources.

Historic sites can potentially meet any of the four criteria for eligibility to the NRHP. Frequently, however, the focus is upon architectural significance or association with

events or individuals of historical importance. Although site-specific historical research is often warranted after a site is identified to determine whether it was associated with an important individual or event, a site's value as an archaeological resource should not be overlooked. When considering a historic site's archaeological value, the condition of structures or burial of cultural deposits are not as important as whether information exists on the site in the form of artifacts or cultural features that can answer questions of particular interest about the past. Sites that can be confidently ascribed to a particular historic theme and subtheme are generally regarded as having more research value than sites that cannot be ascribed to a theme. Significant historic archaeological resources are those that are relatively undisturbed, can be attributed to a specific theme, and retain sufficient artifacts and features to permit further study. Linear cultural resources such as roads, trails, and ditches generally possess little archaeological value, though in some instances they may retain engineering significance or be associated with important historic events. Roads, trails, and railroad grades, however, may have other historic site types associated with them that are important archaeological resources, the proper interpretation of which may depend upon identification of the linear site.

The significance of traditional cultural properties is usually assessed by talking with elders and other knowledgeable individuals of a cultural group, and through historical documentation. Some traditional cultural properties may be significant to an entire cultural group, whereas others may be significant to an individual or family.

REGIONAL OVERVIEW

The earliest inhabitants of west central Colorado may have been representative of the Paleoindian stage, which emphasized the exploitation of megafaunal and floral resources during the period of transition from the Pleistocene to the Holocene dating between 10,000 B.C. and 7800 B.C. This stage has traditionally been identified by a number of distinctive, diagnostic lanceolate projectile points and tool assemblages indicative of a big game hunting economy by what have been termed the Clovis, Folsom, and Plano traditions. Paleoindian components are infrequent in the vicinity of the project area; the stage is mostly represented by surface finds of isolated diagnostic projectile points. While it is possible that these finds may represent reuse of Paleoindian tools by later peoples, the presence of Paleoindian sites and Mammoth bones in western Colorado (Cook 1930; Armstrong 1982) make it seem likely that some of these points represent use of the project area during Paleoindian times. Warming of the environment to essentially modern conditions resulted in the end of the Pleistocene and extinction of several megafaunal species upon which Paleoindian cultures relied. The Archaic stage represents adaptation to the changing environment, mainly by efficiently focusing on a more diverse subsistence base. It is characterized by the hunting of smaller game and increased dependence upon floral resources. The Archaic stage is recognized by large stemmed or stemmed indented base dart points, large side- and corner-notched projectile point forms, and a diverse tool assemblage, including grinding slabs and hand stones. Archaic stage sites are common in west-central Colorado, particularly at lower elevations.

Sometime between A.D. 1 and A.D. 400 a Formative stage lifeway emerged on the northern Colorado Plateau and in the Great Basin. The Formative stage is characterized by considerable reliance on horticulture and the adoption of a sedentary or semi-sedentary lifestyle. Limited quantities of corn and squash as well as Anasazi and Fremont ceramics have been found at some sites in west-central Colorado. In addition, a probable Fremont pithouse was identified in Montrose County (McMahon 1997). These sites have variously been attributed to Navajo (Huscher and Huscher 1943), Anasazi Basketmaker III and Anasazi Pueblo I-II (Hurst 1948), or local populations influenced by the Anasazi and/or Fremont cultural patterns (Schroeder 1964). Reed (1997) has recently suggested the name

"Gateway tradition" for the distinctive tradition first recognized by Schroeder. The Gateway tradition is characterized by the following attributes: (1) Limited reliance upon corn horticulture; (2) manufacture of small arrow points, including the Rosegate variety; (3) procurement through trade of small quantities of Anasazi and, much less frequently, Fremont ceramics; (4) apparent lack of ceramic production; (5) late habitation of noncontiguous circular masonry structures with low walls singly or in small hamlets; (6) possible habitation of pit structures, at least late in the tradition; (7) relatively short-term use of habitation structures, as evidenced by shallow midden deposits; (8) construction of granaries and storage cists in rockshelters; and (9) rock art that evidences both Anasazi and Fremont influence.

The Protohistoric stage in west-central Colorado is generally associated with the Ute occupation. Recorded Ute sites in the area are relatively common. Protohistoric Ute sites are identified by the presence of side- and basal-notched (Desert Side-notched) arrow points and limited brown ware ceramics. Wikiups have also been recorded within this region. Historic period Ute sites have also been recorded in west-central Colorado. These are characterized by Euroamerican goods such as early tin cans, glass, cartridge cases, glass beads, along with cone tinklers cut from tin cans and arrow points fashioned from barrel hoops.

The first European people to enter western Colorado were Spanish explorers. Juan de Rivera led an expedition through the San Juan Mountains in 1761 in search of mineral wealth. In 1776, the Escalante-Dominguez Expedition passed through western Colorado, but did not cross the project area. Exploration of the Southern Rocky Mountains' natural resources by Euroamericans began in the 1820s with the arrival of fur trappers. The fur industry lasted until overtrapping and failing fur prices in the late 1830s made fur trapping unprofitable (O'Rourke 1980). U.S. Government expeditions traversed western Colorado in the 1840s and 1850s, but Euroamerican use of the area was slight until the 1859 discovery of gold in Colorado.

The influx of Euroamericans into the mountain regions of Colorado brought conflict with the indigenous Ute Indians. The Treaty of 1868 between the Utes and the federal government was an attempt to alleviate these conflicts by forming a large reservation on the Western Slope of Colorado, away from the primary mining areas. Miners continued to explore the region however, and by the late 1860s and early 1870s, large bodies of ore had been located in the San Juan Mountains. In 1873, some four million acres of the reservation in the San Juan Mountains was officially opened to Euroamerican exploitation by the signing of the Brunot Treaty. The Brunot Treaty served ultimately to increase hostilities between the Ute and the Euroamericans. By the end of 1881, the last of the Ute were restricted to reservations in northwestern Utah and southernmost Colorado.

The first mining claims were filed in the Telluride area in 1875. Hydraulic mining of placer deposits was an early activity in the glacial deposits in the Keystone Hill area and along the tributaries of the San Miguel River (O'Rourke 1980). Through time, placer mining activity stagnated, but hard rock mining continued to expand. The towns of Ophir, San Miguel City, Placerville, and Columbia were laid out in 1878 as a result of mineral rushes to the region. The Columbia Town Company was reincorporated as the Town of Telluride in 1879. Generation of electricity in the San Juan Mountains was a major factor in maintaining profitability in the region's mines. The Ames Power Plant, located in the project area, was the world's first alternating current electrical plant. The power plant was constructed in 1890 and put online in 1891. Although originally constructed to provide power for one mine, it soon provided power to multiple mines as well as the town of Telluride.

With the growth of mining came the expansion of trails and roads, followed quickly by railroads. Wagon roads and trails connected the mines to newly developing towns where supplies could be obtained and where ore could be processed and shipped. The success of the mines made expansion of railroad lines into the rugged mining terrain economically viable. Expansion into the mining frontier of the San Juans took place in 1891 when Otto Mears constructed the Rio Grande Southern, connecting Ridgway with Durango by way of Lizard Head Pass, with a spur into Telluride. Placerville was a major shipping point for livestock.

In order to satisfy the demands of the mines, farming and ranching quickly took hold in the West End of Montrose and San Miguel Counties. Communities such as Coventry and Shenandoah were established, and irrigation companies were formed to expand the amount of land under cultivation. In 1894, the Colorado Cooperative Company was incorporated, with a goal of establishing a utopian, cooperative community and agricultural land to which an irrigation ditch could be constructed. They first settled at an encampment near Naturita. In 1896, they established the Piñon townsite, just north of the project area at the junction of Cottonwood Creek and the San Miguel River. The 15-mile-long irrigation canal they constructed incorporated the Cottonwood Trestle, which was, in 1903, the world's tallest and longest irrigation flume. The town of Nucla, a colony on 20,000 acres in Tabeguache Park, was settled in 1904 (O'Rourke 1980).

Mining of uranium and vanadium has played an important role in the development of the project area. In the early 1880s, the presence of uranium in the Paradox and Gypsum valleys attracted numerous settlers. At that time, radium derived from uranium was in demand for medical purposes. The establishment of the towns of Naturita and Nucla were largely due to the construction of uranium reduction plants. In 1905, the first vanadium mill in the United States was built at Newmire, originally a placer mining community established along the San Miguel River in 1895 and renamed Vanadium in 1913. Following World War II, federal demand for uranium stimulated rampant exploration throughout western Colorado and eastern Utah. Many of the roads that now exist in the remote areas of the region resulted from this intensive rush to locate viable uranium deposits. With the growth of towns came a need for lumber. Small sawmills were set up wherever sufficient timber was present near settlements. The ponderosa pine belt of the Uncompahgre Plateau was heavily utilized. Most of the mills were for local consumption; however, some of the mills shipped their output on the Rio Grande Southern or produced railroad ties.

The Uncompahgre National Forest (UNF) was established as a Forest Reserve in 1905. This had a profound effect on the way in which those lands were used, principally in regulating grazing and timber cutting. In order to facilitate management of the lands, guard stations, ranger stations, and fire lookouts were built throughout the domain. During the depression years of the 1930s and early 1940s, the Forest Service made many improvements using Civilian Conservation Corps (CCC) and Works Progress Administration (WPA) labor. Many of the roads and campgrounds in use on the forests today are the result of CCC and WPA projects. In 1946, the Bureau of Land Management was established to manage lands in federal ownership not in the jurisdiction of other agencies. This has served to even further establish the role of the federal government in the region. Recreation and tourism have played a tremendous part in the economy and growth of the area, particularly since the 1970s with the development of the ski resort at Telluride.

CLASS I INVENTORY

In order to assess anticipated impacts to significant cultural resources in the project area, a Class I inventory (site file search) was conducted at the Office of Archaeology and Historical Preservation (OAHP), Denver, Colorado; the Norwood Ranger District Office of the Uncompahgre National Forest, Norwood, Colorado; and at the BLM, Uncompahgre

Basin Resource Area, Montrose, Colorado. Locations of previously recorded sites within the project corridors were plotted on project maps, and the following site data were compiled: site type, cultural affiliation, and NRHP status. The NRHP and the State Register of Historic Places for Montrose and San Miguel counties were checked to identify cultural properties listed to date. It must be noted that Class I research results are a direct reflection of previous cultural resource investigations.

Numerous sample-oriented (*i.e.*, "Class II") and intensive (*i.e.*, "Class III") cultural resource inventories have been conducted within or adjacent to the boundaries of the project area (*e.g.*, Baker 1978, 1996; Biggs 1978; Cavanaugh 1990; Conner, Langdon and Rome 1986; Copeland 1978, 1980; Euler 1977; Fike 1994; Gleichman and Legard 1977; Hartley 1983; Kvamme 1979; Lujan 1989, 1992; McDonald and Horn 1986; McKeever 1979; Reed and Horn 1992; Rorex 1982; Steel 1979, 1980; Toll 1975). More than half of the inventories have been block inventories for land exchanges and leases, and the remaining surveys were for linear projects such as seismic lines, powerlines, and pipelines. Cultural resource inventories have been conducted in advance of development and exchange of land managed by the BLM and Forest Service. The higher elevations in the project area, much of which is privately owned land, has received the least intensive inventory coverage. Little or no surveys have been completed on Wilson, Specie, and Beaver Mesas. Cultural resource inventory coverage is also poor along the northern rim of Naturita Canyon. *Table 3.7-1* summarizes the results of these cultural resource inventories and compares the project alternatives using Class I (literature search) information. The comparisons are made using the one-half-mile-wide project alternative corridors. Some sites are shown twice in the table below, because they are impacted by two of the alternatives.

Table 3.7-1
Summation of the Class I Findings by Alternative

Alternative	Sites	NRHP Eligible	Potentially Eligible
Nucla-Norwood Northern	81	4	9
Nucla-Norwood Central	46	1	16
Nucla-Norwood Southern	74	4	28
Norwood-Telluride	16	4	2
Norwood-Sunshine	16	2	1

CLASS II INVENTORY

In order to gain further insight into site distributions and densities within the project area, a sample-oriented ("Class II") cultural resource inventory was conducted by Alpine Archaeological Consultants, Inc. in the fall of 1998. While site densities and distributions in much of the project area could be adequately generalized using results from previous cultural resource inventories, certain areas lacked adequate previous inventory. This lack of information on cultural resources dictated the need for inventory prior to evaluation of alternatives. A sample-oriented cultural resource inventory was designed in order to allow all alternatives to be properly evaluated. In those areas that have not been adequately surveyed, areas of likely prehistoric and historic activity were identified. Areas of likely cultural activity were defined as any area with favorable topography, vegetation, distance to water, and aspect. Thus, areas with steep slopes, lack of adequate subsistence resources, and/or little access to water were not considered. After defining those areas where survey was not likely to find cultural resources, specific inventory areas were chosen and discussed with Bureau of Land Management, Uncompahgre Basin Archaeologist, Rich Fike, and Uncompahgre National Forest, Norwood Ranger District Archaeologist, Robert

McKeever (McKeever 1998: pers. comm.). This resulted in pedestrian inventory of 13 nonrandomly selected study areas, comprising a total of 318 acres. One additional 160-acre area, inventoried by the Forest Service in 1993 but never reported, was identified as a study area and was added to the Class II report (Pfertsh 1999).

The sample-oriented inventory discovered 21 sites. One site is historic Euroamerican, 16 sites are prehistoric, and four have both prehistoric and historic components. Five sites are eligible for the NRHP, three need data to establish their eligibility, and 13 are insignificant (Pfertsh 1999).

NATIVE AMERICAN CONSULTATION

Alpine Archaeological Consultants, Inc. contacted tribal representatives regarding the potential for Traditional Cultural Properties (TCP) that might be affected by construction of the 115 kV transmission line, substations, or distribution lines. A packet of information containing a letter that described the Project, maps of the project area, and summary tables listing the cultural resource sites and isolated finds in the ½-wide project corridor was mailed to the following tribes on June 15, 1999: Northern Utes (Uintah and Ouray bands), Southern Utes, Ute Mountain Utes, Hopi Pueblo, and Zuni Pueblo.

As of September 1, 1999, representatives of two tribes have responded. The Northern Ute Tribe requested additional information regarding several sites in the corridor, and have since not formally responded. The Hopi Cultural Preservation Office (HCPO) submitted a formal letter detailing their claims to archaeological materials in the project area. In addition, the Hopi Tribe has requested a meeting to further discuss consultation needs for this Project. Further Native American consultation must occur prior to construction, regardless of the alternative selected.

CULTURAL RESOURCE SENSITIVITY AREAS

Taken as a whole, the cultural resource surveys have provided data on where sites are located, and perhaps just as importantly, have identified locales where sites are less likely to be located. USGS topographic maps, vegetation maps, and faunal distribution maps, in concert with the site data, allow identification of areas with high, moderate, and low sensitivity for cultural resources. The following is extrapolated from the Class I and Class II data in the project area. The Cultural Sensitivity Areas are shown in ***Plate CULTURAL-1***.

The high cultural sensitivity areas, where cultural resources are expected to be most abundant, are in the lower elevations (5,600 to 7,500 feet) of the project area, which are elk and mule deer wintering zones. Areas of likely high sensitivity for cultural resources include the following:

- Areas within one mile of canyon rims with permanent water, drainage terraces, rim overhangs, and ridge tops (*i.e.*, Beaver Canyon, Naturita Canyon, and San Miguel Canyon).
- Areas within pinyon and juniper stands on the edges of sagebrush openings, which had more to offer in terms of diversity of plants and animals.
- Areas associated with historic mining activities.
- Areas of intensive agricultural settlement in historic times are expected to contain historic cultural resources such as homesteads and irrigation systems.

The moderate cultural sensitivity areas, where moderate numbers of cultural resources are expected, occur across the project area. Areas of moderate sensitivity for cultural resources include:

- Areas of largely level terrain with ready access to water and food resources (*i.e.*, Beaver Mesa and the area surrounding the Norwood Substation).

- Areas between one and two miles from canyon rims which contain permanent or semipermanent tributary streams.
- Marginal agricultural lands that are expected to contain abandoned farms and ranches that were occupied for short periods, occasional long-term or currently occupied farms and ranches, and camps related to sheep and cattle grazing.
- Areas where low-production mining took place.

Low cultural sensitivity areas are those areas where little to no cultural resources are expected. These are predominantly the steep slopes and rolling hills in the higher elevations in the eastern portion of the project area. Low cultural sensitivity areas also exist in the western portion of the project area, in locations far from permanent water and on expanses of rolling hills or steep slopes. Historic site types expected in the low sensitivity zone include small campsites or trash scatters and occasional evidence of briefly occupied farms and ranches. Few sites in the low cultural sensitivity zone are expected to be recommended as NRHP eligible.

3.7.2 ENVIRONMENTAL CONSEQUENCES

3.7.2.1 ANALYTICAL FRAMEWORK

Potential Types Of Impacts

Cultural resources are highly sensitive to ground disturbance. Direct impacts to prehistoric and historic archaeological sites would occur from ground-disturbing activities associated with construction of the proposed transmission line itself (*i.e.*, excavation, burial, earth moving) as well as with the use, upgrade, and construction of access roads. Most archaeological sites in the project area are shallow, so cultural deposits would be damaged or destroyed by vegetation clearing and blading or excavation of soils. Standing historic structures, because they are readily identifiable, can more easily be avoided by construction activities.

Cultural resources may also be subject to indirect impacts such as increased vandalism, artifact collection from the surface of sites, and illegal excavation of archaeological sites as a result of opening previously inaccessible areas to construction crew members and to the general public. Such indirect impacts pose a threat to cultural resources because those activities destroy the potential for recovery of significant scientific information regarding the past. Indirect impacts can also destroy the character of the site, making it worthless for future public enjoyment or education. Indirect impacts to cultural resources would potentially occur as a result of the increase in access to areas currently accessible only on foot. The building and upgrading of access roads for the proposed Project would supply additional access to culturally sensitive areas.

The Advisory Council on Historic Preservation (ACHP) has set procedures (36 CFR 800) to be followed to determine the effect a project may have on significant cultural resources and how to mitigate that effect if it is determined to be adverse. When no sites or properties eligible to or listed on the NRHP are located in the Area of Potential Effect (APE), a proposed action can be determined to have "No Historic Properties," and the action can be allowed to proceed with no further archaeological work. If any site(s) currently on or eligible for nomination to the NRHP is present in the APE, steps must be taken to avoid adverse impacts to the cultural property. An action is considered to have an adverse effect when it may diminish the integrity of the significant property's location, design, setting, materials, workmanship, feeling, or association. Adverse effects include but are not limited to:

- Physical destruction, damage, or alteration of all or part of the property

- Isolation of the property from or alteration of the character of the property's setting, when the character contributes to the property's eligibility to the NRHP
- Introduction of visual, audible, or atmospherical elements that are out of character with the property or alter its setting
- Neglect of a property resulting in its deterioration and destruction
- Transfer, lease, or sale of the property

For most archaeological sites, physical damage is of the greatest concern. Impacts to a property's setting are more likely to adversely affect historic structural sites or rural historic landscapes. All five effects would probably be considered adverse impacts to traditional cultural properties significant to Native Americans.

- Impacts to sites that do not meet the NRHP criteria for significance are not considered significant. In addition, effects of an undertaking that would otherwise be found to be adverse can be mitigated when the historic property is of value for its potential contribution to archaeological, historical, or architectural research, and when those significant values can be substantially preserved through research or archaeological data recovery effects conducted in accordance with applicable professional standards and guidelines.

Definition of Impact Levels

Because a 100% survey of cultural resources will not be conducted until after the EIS is complete and a proposed project is selected, the numbers and types of significant sites within the various alternatives are unknown. Consequently, in order to discuss the likely potential effects to cultural resources from each of the alternatives, an impact model has been developed that considers both cultural sensitivity levels and potential degree of ground disturbance that may result from project construction. The matrix is shown in *Table 3.7-2*.

Table 3.7-2
Matrix for Determining Degree of Effect on Cultural Resources

Cultural Sensitivity	Degree of Ground Disturbance		
	High	Moderate	Low
High	High	Moderate	Moderate
Moderate	Moderate	Moderate	Low
Low	Low	Low	Low

For purposes of the EIS analysis, the APE is defined as the one-half-mile-wide alternative corridors. The use and upgrade of access roads represents the highest impact to cultural resources. In the case of construction of an overhead transmission line, access roads generally cause larger amounts of actual and continued ground disturbance when compared to the burial of transmission poles. Because of this, as well as their potential indirect impacts, access roads are the best means to measure degree of effect from construction of the 115 kV transmission lines. The four types of access conditions and the associated degree of ground disturbance are as follows:

- Helicopter construction only — low ground disturbance
- Helicopter construction with limited use of existing access roads — moderate ground disturbance
- Use of existing access roads and overland construction — moderate ground disturbance
- Upgrading and widening of existing access roads — high ground disturbance

Substation modifications would also potentially impact cultural resources. All modifications to substations, including enlargement, construction and destruction, would result in a high degree of ground disturbance.

Other modifications to the 69 kV line and distribution system would also result in several different types and degrees of ground disturbance, that are evaluated as follows:

- Construction of, or conversion to, underground lines — high degree of ground disturbance.
- Construction of new overhead distribution lines — moderate ground disturbance when existing access roads are used; high disturbance if access roads are widened or newly constructed.
- Existing distribution underbuilt — moderate disturbance when existing access roads are used; high disturbance if access roads are widened or newly constructed. Effects would be of the same degree as the 115 kV line being underbuilt.
- Removal of existing 69 kV line and or reuse of existing poles — moderate disturbance when existing access roads are used; high disturbance if access roads are widened or newly constructed.

Applicable Permits, Standards and Ordinances

A variety of federal and state laws and regulations address requirements for the identification and management of cultural resources. Legal requirements relevant to the Nucla-Telluride Project that would be complied with include the following:

- National Historic Preservation Act (16 U.S.C. § 470 *et seq.*) - Section 106 requires that federal agencies take into account the effects of proposed actions on cultural resources on or eligible for the National Register.
- Protection of Historic Properties (36 C.F.R. § 800) - This regulation specifies procedures for federal agencies to consult with the State Historic Preservation Officer, the Advisory Council on Historic Preservation and interested parties in fulfilling its NHPA Section 106 responsibilities.
- Archaeological Resources Protection Act (16 U.S.C. § 470aa *et seq.*) - This act protects archaeological resources on federal land and requires that permits be acquired prior to the excavation or removal of such resources.
- American Indian Religious Freedom Act (42 U.S.C. § 1996) - This act creates a federal policy to protect the rights of Native American groups to practice traditional religions, including rights of access to sacred sites.
- Native American Graves Protection and Repatriation Act (24 U.S.C. § 3002 *et seq.*) - This act gives federally recognized tribes ownership rights over Native American burials and items of cultural patrimony that are within Federal custodianship or are found on federal land.
- Colorado State Antiquities Act (C.R.S 24-80) - This act specifies procedures for obtaining permits for archaeological activities, procedures for permitted persons/-entities to consult the Colorado State Archaeologist, and procedures for handling of unmarked burials of human remains in the State of Colorado.

Environmental Protection Measures

As outlined in section 2.3, above, Tri-State has committed to implementing a number of standard mitigation measures (*Table* 2.2-4, Chapter 2). The following committed measures would minimize the potential for adverse impacts to cultural resources: numbers 4, 44, 45, 46, 47 and 48.

3.7.2.2 IMPACTS OF THE PRIMARY TRANSMISSION ALTERNATIVES

In the following subsections, the potential effects of each alternative on cultural resources are considered and discussed with regard to the 115 kV transmission line, any alterations to substations, and the associated changes to the 69 kV line and distribution system. All assessments of effects are based on the methods discussed above. Impact findings are reported in acres for each of the one-half-mile-wide alternative corridors. *Table 3.7-3* summarizes the impact results.

Table 3.7-3
Comparison of Effects on Cultural Resources by Alternative

	Acres of High Effects	Acres of Moderate Effects	Acres of Low Effects	Total Acres
Nucla-Norwood Northern Alternative				
115 kV Transmission Line	155.1	4,869.7	861.3	5,886.1
Nucla-Norwood Central Alternative				
115 kV Transmission Line	329.2	4,062.6	1,965.3	6,357.1
69 kV Removal (Link 1)	0.0	139.2	2.7	141.9
Nucla-Norwood Southern Alternative				
115 kV Transmission Line	504.5	3,815.7	1,621.7	5,941.9
69 kV Removal (Links 1, 2 and 3)	0.0	190.4	4.5	194.9
Norwood-Sunshine Alternative				
115 kV Transmission Line	405.5	4,773.6	4,085.9	9,265.0
New Distribution near Oak Hill Substation	16.5	0.0	0.0	16.5
Norwood-Telluride Alternative				
115 kV Transmission Line	405.9	4,576.0	4,695.7	9,677.6
Distribution System (69 kV Removal, 69 kV burial, 69 kV converted to distribution) (Links 14 and 15)	0.0	14.1	122.2	136.3
New Distribution near OakHill Substation	16.5	0.0	0.0	16.5
Transmission Alternatives				
Norwood Substation Site B	0.0	518.0	0.0	518.0
Subalternative A	0.0	494.8	0.0	494.8
Subalternative B	0.0	698.2	0.0	698.2
Subalternative C	0.0	454.7	0.0	454.7
Subalternative D	0.0	0.0	382.9	382.9
Subalternative E	0.0	512.5	138.1	650.6

Nucla-Norwood Northern Alternative

115 kV Transmission Line Effects

Along the Nucla-Norwood Northern Alternative corridor, the following potential impact levels were identified based upon the cultural resource sensitivity findings and potential

degrees of ground disturbance resulting from the project construction: 115.1 acres of high impacts; 4,869.7 acres of moderate impacts; and 861.3 acres of low impacts. A considerable portion of this alternative parallels the Naturita Canyon rim where cultural resources are known to be relatively abundant, resulting in a high percentage of high impact acres. Four known sites within the project corridor are officially NRHP eligible. These include a Formative camp, a Late Prehistoric camp, a multicomponent site with architecture, and the historic Fall Creek Tram, which is also on the Colorado State Register of Historic Places.

As mentioned previously, cultural resources may be subjected to indirect impacts such as increased vandalism, artifact collection from the surface of sites, and illegal excavation of archaeological sites as a result of opening previously inaccessible areas to construction crew members and to the general public. There is not likely to be any increase in the potential for these types of impacts on the Nucla-Norwood Northern Alternative.

Substation Effects

The 1.9-acre enlargement of the Norwood Substation at its existing location (Site A) would cause no additional impacts beyond those reported for the 115 kV transmission line.

69 kV Transmission Line and Distribution System Effects

No additional impacts, beyond those reported above for the 115 kV transmission line would result from the construction of this alternative. Since the 69 kV line would be replaced as a 115 kV system for this alternative, impacts associated with the 69 kV line modifications are the same as reported for the 115 kV transmission line above. Other distribution system modifications for this alternative are confined to underbuilding one mile of distribution on the new 115 kV line poles. The areas to be impacted by these modifications are reported above for the 115 kV transmission line.

Nucla-Norwood Central Alternative

115 kV Transmission Line Effects

Along the Nucla-Norwood Central Alternative corridor, the following potential impact levels were identified based upon the cultural resource sensitivity findings and potential degrees of ground disturbance resulting from the project construction: 329.2 acres of high impacts; 4,062.6 acres of moderate impacts; and 1,965.3 acres of low impacts to cultural resources. One known site within the project corridor is officially NRHP eligible. This site is a historic homestead and prehistoric camp of unknown age.

The widening of access roads in the western portion of this alternative would increase accessibility to the area, and is likely to cause an increase in indirect impacts to cultural resources in the area. The use of existing access roads in the eastern portion of this alternative is not likely to increase indirect impacts to cultural resources on the Nucla-Norwood Central Alternative.

Substation Effects

Impacts of expanding the Norwood Substation at Site A would be the same as previously described for the Nucla-Norwood Northern Alternative.

69 kV Transmission Line and Distribution System Effects

With this alternative, the existing 69 kV line would be removed along Link 1 from the Nucla Power Plant to Link 2. The potential impacts of removing this section of line are estimated to be moderate for 139.2 acres and low for 2.7 acres. As mentioned in the discussion of the Nucla-Norwood Northern Alternative, these activities on and around the rim of Naturita Canyon are likely to impact a relatively high number of cultural resources. Other distribution system modifications include underbuilding of the existing distribution line on the 115 kV system. No additional impacts to cultural resources, beyond those reported for the 115 kV line, would be expected.

Nucla-Norwood Southern Alternative

115 kV Transmission Line Effects

Along the Nucla-Norwood Southern Alternative corridor, the following potential impact levels were identified based upon the cultural resource sensitivity findings and potential degrees of ground disturbance resulting from the project construction: 504.5 acres of high impacts; 3,815.7 acres of moderate impacts; and 1,621.7 acres of low impacts to cultural resources. Four known sites within the project corridor are officially NRHP eligible. These include a Late Prehistoric camp, a multicomponent architectural site, a prehistoric camp of unknown age, and a prehistoric architectural site of unknown age.

As with the Nucla-Norwood Central Alternative, the widening of access roads on this alternative would increase accessibility to the area, and is likely to cause an increase in indirect impacts to cultural resources in the area. The use of existing access roads and helicopter construction methods are not likely to increase indirect impacts to cultural resources on those portions of the Nucla-Norwood Southern Alternative.

Substation Effects

Impacts of expanding the Norwood Substation at Site A would be the same as previously described for the Nucla-Norwood Northern Alternative.

69 kV Transmission Line and Distribution System Effects

With this alternative, the existing 69 kV line would be removed along Links 1, 2 and 3. The potential impacts of removing this section of line are estimated to be moderate for 190.4 acres and low for 4.5 acres. As mentioned, these activities on and around the rim of Naturita Canyon are likely to impact a relatively high number of cultural resources. Other distribution system modifications include underbuilding of the existing distribution line on the 115 kV system. No additional impacts to cultural resources, beyond those reported for the 115 kV line, would be expected.

Norwood-Sunshine Alternative

115 kV Transmission Line Effects

Along the Norwood-Sunshine Alternative corridor, the following potential impact levels were identified based upon the cultural resource sensitivity findings and potential degrees of ground disturbance resulting from the project construction: 405.5 acres of high impacts;

4,773.6 acres of moderate impacts; and 4,085.9 acres of low impacts to cultural resources. One known site within the project corridor is field eligible to the NRHP. This site includes two recorded segments of the Rio Grande Southern Railroad.

The use of existing access roads and helicopter construction is not likely to increase indirect impacts to cultural resources on the Norwood-Sunshine Alternative.

Substation Effects

The 0.5-acre enlargement of the Sunshine Substation, dismantling of the Oak Hill Substation, and minor tap modifications to the Specie Mesa and Wilson Mesa Substations would cause no additional impacts beyond those reported above for the 115 kV transmission line.

69 kV Transmission Line and Distribution System Effects

With construction of the Norwood-Sunshine Alternative, the existing 69 kV line would be rebuilt as a 115 kV transmission facility. Consequently, no additional impacts to cultural resources would result from the 69 kV modifications beyond those reported above for the 115 kV transmission line.

Other modifications to the distribution system would entail underbuilding the distribution service on the 115 kV system poles and undergrounding distribution service for approximately 0.4-mile west of the Sunshine Substation. Since underbuilding the distribution system would be within the same right-of-way as the 115 kV line, no additional impacts to cultural resources would result beyond those reported for the 115 kV transmission facility. Potential impacts to cultural resources caused by the undergrounding of distribution service, however, would be more difficult to avoid if sites were encountered along the right-of-way. Moderate effects on cultural resources are assessed for these areas. Finally, this alternative would entail constructing approximately 4 miles of new overhead distribution service between the Norwood and Oak Hill Substations. Potential impacts to cultural resources are assessed as high.

Norwood-Telluride Alternative

115 kV Transmission Line Effects

Along the Norwood-Telluride Alternative corridor, the following potential impact levels were identified based upon the cultural resource sensitivity findings and potential degrees of ground disturbance resulting from the project construction: 405.9 acres of high impacts; 4,576.0 acres of moderate impacts; and 4,695.7 acres of low impacts. Four known sites within the project corridor are field eligible to the NRHP. These include a segment of the Rio Grande Southern Railroad, the Newmire/Vanadium Townsite, the Vance Junction coal chute (also on the Colorado State Register of Historic Places), and the Primos No. 1 Mill Site House.

The use of existing access roads and helicopter construction is not likely to increase indirect impacts to cultural resources on the Norwood-Telluride Alternative.

Substation Effects

The modifications to the Telluride and Specie Mesa Substations and dismantling of the Oak Hill Substation would cause no additional impacts beyond those reported above for

the 115 kV transmission line. The dismantling of the Wilson Mesa Substation would cause no additional impacts beyond those reported below for the 69 kV transmission line and distribution system.

69 kV Transmission Line and Distribution System Effects

With construction of the Norwood-Telluride Alternative, 7.2 miles of the existing 69 kV line would also be dismantled along Link 15. The potential impacts of removing this section of line are estimated to be moderate for 14.1 acres and low for 112.2 acres.

Modifications to the distribution system would entail underbuilding the distribution service on the 115 kV system poles, undergrounding distribution service for approximately one mile west of Wilson Mesa Substation, converting the 69 kV transmission line to distribution, and undergrounding other distribution service for one mile west of the Telluride Substation. Underbuilding the distribution service and activities near the Telluride Substation would be within the same right-of-way as the 115 kV line, thus no additional impacts to cultural resources would result beyond those reported for the 115 kV transmission facility. Potential impacts to cultural resources caused by the undergrounding of distribution service, however, would be more difficult to avoid if sites were encountered along the right-of-way. The distribution line would be buried mostly within the Galloping Goose Trail, the abandoned Rio Grande Southern narrow gauge railroad right-of-way, which is a significant historic site. Mitigation of effects on these cultural resources would be required. Finally, this alternative would entail constructing approximately 4 miles of new overhead distribution service between the Norwood and Oak Hill Substations. Potential impacts to cultural resources are assessed as high.

3.7.2.3 IMPACTS OF THE SUBALTERNATIVES

115 kV Transmission Line Routing Alternatives

Subalternatives A, B, C, D, E: The 494.8 acres of Subalternative A, 698.2 acres of Subalternative B, and 454.7 acres of Subalternative C would have moderate effects to cultural resources from construction of the 115 kV transmission line. The 382.9 acres of Subalternative D are in an area where low effects to cultural resources are anticipated. Subalternative E would have moderate effects for 512.5 acres and low effects for 138.1 acres.

Underground Subalternative

The Underground Subalternative would physically disturb portions of the Beaver, Specie, Wilson, and Sunshine mesa tops. These areas are considered to be of moderate to low cultural sensitivity ***(Plate CULTURAL-1)***. The degree of physical disturbance along the five foot-wide trench would be high. The potential for impacts to cultural resources are assessed as moderate to low in degree.

Norwood Substation Alternative Site B

The building of Norwood Substation Alternative Site B would have moderate effects to cultural resources on 518.0 acres, due to construction of a new overhead 115 kV line, construction of a new distribution line, and construction of the substation. Because of the previously disturbed nature of the current Norwood Substation, the removal of that facility would have minimal effects on cultural resources.

3.7.2.4 CUMULATIVE EFFECTS

Potential future development in the project area that would result in cumulative affects to cultural resources include timber burns and sales, a proposed hydroelectric project, residential development, and recreational sites and trails.

Two planned timber burns proposed between 1999 and 2010 on BLM and private land south of the town of Redvale occur in areas of low to high sensitivity for cultural resources. These burns have not yet been subject to cultural resource inventories. Forest Service timber burns on the Ed Joe Draw, Bull Pond, and Busted Arm timber sales were surveyed for cultural resources in conjunction with those timber sales, and significant cultural resources would be managed in accordance with the management recommendations in those cultural resource inventory reports (Greubel 1991; Greubel *et al.* 1991; Horn 1991).

The Town of Telluride is seeking renewal of their FERC permit for a proposed hydroelectric project. The proposed pipeline route would be "buried mostly within an abandoned narrow gauge railroad right-of-way," which is a significant historic site. Mitigation of effects would be required.

Increased residential subdivision development is likely to result in adverse impacts to cultural resources. Such impacts are unlikely to be mitigated because there no legal mandates that require mitigation on private land. In particular, residential subdivisions proposed in the vicinity of Norwood and Gurley Reservoir are in areas of moderate to high sensitivity for cultural resources. Increased residential development may also occur on land parcels received in exchanges from the BLM or FS. Land exchange parcels would be surveyed for cultural resources before leaving federal ownership.

Recreation sites and trails also have the potential to impact significant cultural resources. The Galloping Goose Trail development makes use of the railroad grade for a recreational trail. The proposed trail extension is unlikely to have adverse impacts on significant segments of the railroad grade.

3.7.2.5 POTENTIAL MITIGATION MEASURES AND RESIDUAL EFFECTS

Potential direct impacts to cultural resources would be avoided or reduced through the implementation of a number of standard mitigation measures (*Table 2.2-4*), as well as by all standard mitigation measures that reduce the level of ground disturbance during project construction. The following environmental protection measures (EPM) will minimize the potential for adverse impacts to cultural resources:

EPM-4: The contractor will comply with all federal, state and local environmental laws, orders and regulations. Prior to construction, all supervisory construction personnel will be instructed on the protection of cultural and ecological resources. To assist in this effort, the construction contract will address: (a) federal and state laws regarding antiquities and plants and wildlife, including collection and removal, and (b) the importance of these resources and the purpose and necessity of protecting them.

EPM-44: Before construction, Tri-State will perform a Class III (100% of surface) cultural survey on all areas to be disturbed, including structure sites and new access ways. A product of the survey will be a Cultural Resources Report, recording findings and suggesting mitigation measures. These findings will be reviewed with the State Historic Preservation Offices and other appropriate agencies, and specific mitigation measures necessary for each site or resources will be determined. Mitigation may include careful relocation of access roads, structure sites and other disturbed areas to avoid cultural sites that should not be disturbed, or data recovery is impacts are unavoidable.

EPM-45: Prior to construction, all supervisory construction personnel will be instructed on the protection of cultural resources with reference to relevant laws and penalties, and the need to cease work in the location if cultural resource items are discovered.

EPM-46: Should any cultural resources that were not discovered during the Class III Survey be encountered during construction, ground disturbance activities at that location will be suspended until the provisions of the National Historic Preservation Act and enabling legislation have been carried out.

EPM-47: Construction activities will be monitored or sites flagged by a consultant, under the direction of Forest Service and BLM staff to prevent inadvertent destruction of any cultural resource for which the agreed mitigation was avoidance.

EPM-48: Construction crews will be monitored to the extent possible to prevent unauthorized removal or disturbance of cultural artifacts or materials from sites where the agreed mitigation was avoidance.

The following additional mitigation measures are also suggested:

- Existing 69 kV poles identified for removal within the boundaries of significant cultural resource sites should be cut off at the base.
- Procedures should be developed for consulting with any interested persons or affected Native American groups on issues that may involve traditional cultural properties.
- Procedures should also be developed for addressing the discovery of human remains, including consultation with federal and state officials and Native American groups.

Mitigation of indirect impacts to cultural resources, such as increased illegal collecting as a result of improved access, is more difficult to achieve. A locked gate on access roads is one recommended measure for reducing access to cultural resources in remote areas.

No significant unavoidable adverse effects to cultural resources are anticipated with implementation of any of the proposed alternatives. It is possible, however, that inadvertent destruction of some cultural resources may occur. In addition, archaeological data recovery (excavation) of a cultural resource site is an irretrievable commitment of a nonrenewable resource.

3.7.2.6 IMPACTS OF GENERATION ALTERNATIVES

Development of a Distributed Generator Alternative would result in ground disturbances at the generator site (approximately 1 to 3 acres). In addition, ground disturbances would occur from the extension of the gas pipeline, and from modifications to the transmission, substation and distribution system that would still be necessary. The general locales where potentially feasible generator sites have been identified are considered to have low cultural resource sensitivity.

With respect to the transmission, substation and distribution system modifications that would need to occur with a Large Generator Alternative, the likelihood of cultural resource impacts occurring would be the same as described previously for the Nucla-Norwood Alternatives. With the Small and Emergency Generator scenarios, the potential for cultural resource effects would also include impacts from rebuilding the Norwood-Sunshine Line (see Section 3.7.2.2 for further information).

3.7.2.7 NO ACTION ALTERNATIVE

The No Action Alternative would require the upkeep, and possibly the improving, of the current access road system. This use of these access roads to maintain and replace the aging system would result in impacts to cultural resources that are roughly equivalent to those that would result in replacement of the line. Such impacts are ongoing but unknown, because no cultural resource inventory was conducted prior to the construction of the existing 69 kV transmission line or access roads.

3.8 LAND USE

ISSUES: The proposed Project would require the applicants to obtain rights-of-way easements and special use permits across public and private lands. Utility easements for transmission facilities may limit existing land use activities within the right-of-way, or be inconsistent with the adopted plans and policies of federal and state land management agencies and local governments. Scoping comments related to land use included avoiding fertile agricultural lands and impacts to irrigation systems as well as avoiding fragmentation of subdivisions and other areas of human concentration. Suggestions included consolidating infrastructure along existing roads and other already disturbed areas.

3.8.1 AFFECTED ENVIRONMENT

The Land Use section addresses the following specific issues associated with the project area: land ownership and jurisdictions; existing land use patterns and predominant uses; proposed developments and ongoing planning programs of federal, state and local governments; and pertinent policies and guidelines of adopted federal, state, and local plans. A number of related topics are discussed in other sections of this EIS, including Geology, Paleontology and Minerals (Section 3.3), Recreation (Section 3.9), Visual Resources (Section 3.10), Socioeconomics (Section 3.11), Transportation (Section 3.12), Noise (Section 3.13), and Human Health and Safety (Section 3.14).

The land use project area includes private and public lands within the project alternative corridors and adjacent lands within 0.5 mile of the corridor alignments that may be affected directly or indirectly by the project construction and operation. Within the project area, an inventory of land uses was created from existing planning documents, geographic information system (GIS) files provided by the Forest Service, BLM and counties, and 1997 aerial photographs. Color aerial photographs of the project area were produced at a scale of 1:24,000 (scale 1"=2,000') and ortho-corrected in the autumn of 1997. Photographs were interpreted to classify and delineate existing land uses. Field verification of the land use inventory was conducted in 1998 and spot-checked for changes in 1999.

For information on planned land use issues, federal, state and local agencies were contacted including the relevant planning and assessors' offices of Montrose and San Miguel Counties, the State of Colorado School Land Trust and the Colorado Department of Transportation (CDOT). Information was extracted from data provided by these agencies as well as from a review of adopted plans and policies, and available maps; published data files and environmental documents; and consultations with jurisdictional and planning staff representatives. Plans and studies reviewed include the *Amended Land and Resource Management Plan for the Grand Mesa, Uncompahgre and Gunnison National Forest* (Forest Plan 1991), the *San Juan/San Miguel Resource Management Plan and Environmental Impact Statement* (1984), the *San Miguel County Comprehensive Development Plan* (adopted in 1978 and amended in 1995), and Montrose County's *Uncompahgre Valley Master Plan* (1989).

REGIONAL OVERVIEW

Within southwestern Colorado land ownership patterns are characterized by large blocks of federal lands administered by the U.S. Department of Agriculture, Forest Service (Forest Service), and the U.S. Department of Interior, Bureau of Land Management (BLM). Smaller checkerboard holdings of public BLM lands and Colorado State Lands are also dispersed throughout the project area. Private lands in the project area fall within the local jurisdictions of Montrose and San Miguel Counties. ***Plate PROJECT-1*** shows the jurisdictional boundaries of project area lands administered by federal, state, and local agencies.

The land use character of the project area reflects the historical ranching, farming and mining heritage of the area, as well as recent trends in recreational and resort developments. Farming and ranching remain the prevalent type of land use and source of local economy in the western part of the project area, primarily in Montrose County and portions of San Miguel County near Norwood. Towns and communities in this area include Nucla, Redvale, and Norwood. These towns principally support the local population and economy and provide goods and services for residents and tourists passing through the region. In contrast, the character of land uses in the central and eastern parts of the project area reflect both the mining and ranching history of the region in combination with recent trends in recreation and resort developments. The San Juan Mountains and the San Miguel River and its tributaries provide a rich landscape of exceptional natural resources, visual and recreational values. Recreation and visual issues are described separately in this EIS in Sections 3.9 and 3.10, respectively. The towns of Telluride and Mountain Village and the Telluride Ski Area are the major resort- and recreation-oriented centers in the project area and are located on the eastern fringe. Lands within the central and eastern part of the project area primarily support public and private open space and dispersed residential uses. Permanent residences, second homes, community support services, and public National Forest and BLM lands used for seasonal recreational opportunities are the most evident land uses.

Major transportation corridors through the region include State Highways 145 and 62. State Highway 145 enters the study area near the northwest border and provides direct access to the Towns of Telluride and Mountain Village. State Highway 62 extends approximately 17 miles southwest from the Town of Ridgway and intersects State Highway 145 near Placerville.

Several existing electrical transmission lines transect portions of the project area, including Tri-State's Nucla-Cahone and Nucla-Montrose 115 kV powerlines in the east end, the Western Area Power Administration 345 kV/230 kV powerlines in the central section, and the Hesperus-Cascade 115 kV line in the Ilium Valley in the eastern area. In addition, the TransColorado Natural Gas Pipeline extends through the project area just west of the community of Redvale.

LAND OWNERSHIP AND JURISDICTIONS

FOREST SERVICE - UNCOMPAHGRE NATIONAL FOREST

Portions of the Uncompahgre National Forest (UNF) are in the southern and eastern edges of the project area. Within the region, large tracks of the Uncompahgre National Forest can be found south of Norwood, in the south-central part of the project study area and at the eastern end near Lone Cone and the towns of Telluride and Mountain Village. National Forest lands are within the Norwood District of the Grand Mesa, Uncompahgre and Gunnison National Forest (GMUG). National Forest lands are administered by the Norwood District, in Norwood Colorado and the GMUG Supervisor's Office in Delta, Colorado.

BLM - UNCOMPAHGRE FIELD OFFICE

The BLM administers public lands within the western, northern, and eastern parts of the project area. Within the region public BLM lands consist of large blocks and dispersed checkerboard holdings. Public lands are found extensively throughout the project area. In the northern and central portions of the project area larger blocks of public BLM lands are found in the vicinities of the San Miguel River Canyon, Beaver Canyon, Saltado Creek, Fall Creek and Bear Creek. Public BLM lands also extend from along the San Miguel River corridor from Placerville to approximately 3 miles west of the Telluride Substation, and south along Ilium Valley (*Plate PROJECT-1*). The BLM lands lie within the San Juan-San Miguel Resource Area and are administered through the Uncompahgre Field Office in Montrose, Colorado.

STATE OF COLORADO LANDS

The State of Colorado administers two sections of state school lands in the project area *(Plate PROJECT-1)*. The state lands are located near the eastern and western sections of the project area.

PRIVATE LANDS

Private lands are within San Miguel and Montrose Counties (*Plate PROJECT-1*). Portions of San Miguel County comprise the central and eastern parts of the project area, while Montrose County forms the western section. Large blocks of private lands are found on several mesas, including Wrights Mesa, Beaver Mesa, Specie Mesa, Wilson Mesa and Sunshine Mesa. In addition, smaller parcels of private lands are dispersed throughout the project area and encompass several incorporated and unincorporated communities. Montrose County communities within the project area or surrounding region include Nucla, Naturita and Redvale. Within San Miguel County, the communities of Norwood, Placerville, Sawpit, Telluride and Mountain Village are within or near the project area.

EXISTING LAND USES

The existing land uses of the project area are shown in ***Plates LAND-1*** and ***LAND-2***. ***Plate LAND-1*** shows the distribution and types of land uses within and adjacent to the alternative corridors by the categories defined below. ***Plate LAND-2*** shows the relationship of the alternative corridors to the existing transmission and distribution systems within the project area and surrounding parts of San Miguel and Montrose Counties. Recreation facilities and uses are described separately in Section 3.9. Existing land uses in ***Plate LAND-1*** include:

- Communities and Towns – Nucla, Redvale, Norwood, Sawpit, Telluride, Mountain Village.
- Residential - includes rural residential, single-family and multi-family residential (including both permanent and seasonal/second homes); residential/commercial mixed uses. Rural residences are dispersed throughout agricultural and ranching areas and on private lands. Single and multi-family residential are mainly concentrated near Telluride, on Lawson Hill and in the Ilium Valley.
- Commercial – includes businesses and service establishments. Commercial uses are found along Highway 145 and in Ilium Valley.
- Public Facilities – includes municipal facilities such as a water treatment plant, a county jail, municipal buildings and services.
- Cultural Facilities – such as private performing art centers and theaters.
- Schools – private and public schools.
- Churches and cemeteries.
- Airport – Telluride Regional Airport and runway.
- Airstrip – Private unpaved airstrips and runways.
- Mixed Commercial/Light Industrial – including lumber yards, storage yards for commercial building materials.
- Light Industrial – including industrial parts and light manufacturing.
- Heavy Industrial and Extractive – mineral extractive, salvage yards, sand and gravel operations.
- Power Facilities – including the Nucla Power Plant, substations, 69 kV, 115 kV, 220 kV and 345 kV transmission lines and distribution lines.

- Irrigated Agriculture - irrigated field crops, pastures and meadows. Irrigated agriculture is primarily concentrated in the western part of the project area around Norwood and Redvale. Principal products include winter wheat, spring wheat, barley, oats, dry beans and hay.
- Prime or Unique Farmlands - land that has the best physical and chemical characteristics for producing food, feed, forage, fiber and oilseed crops (Soil Conservation Service, undated). Within the project area, prime farmlands are located on the following soil associations:
  - — Abra loam, 1 to 3 percent slopes (where irrigated)
  - — Aquolls, 0 to 3 percent slopes (where irrigated)
  - — Barx fine sandy loam, 1 to 3 percent slopes (where irrigated)
  - — Barx fine sandy loam, 3 to 6 percent slopes (where irrigated)
  - — Begay fine sandy loam, 1 to 6 percent slopes (where irrigated)
  - — Abra loam, 3 to 6 percent slopes (where irrigated)
  - — Abra loam, 6 to 12 percent slopes (where irrigated)
  - — Callan loam, 1 to 3 percent slopes (where irrigated)
  - — Callan loam, 3 to 6 percent slopes (where irrigated)
  - — Acres loam, 1 to 6 percent slopes (where irrigated)
  - — Haplaquolla, 0 to 3 percent slopes (where irrigated)
  - — Mitch loam, 1 to 6 percent slopes (where irrigated)
  - — Nyswonger silty clay loam, 1 to 4 percent slopes (where irrigated)
  - — Paradox fine sandy loam, 1 to 4 percent slopes (where irrigated)
- Open Space/Grazing - including non-irrigated agriculture, grazing land and public lands. Specific uses typically associated with open space include ranching, hunting, dispersed recreation and nature preserves. The BLM permits livestock grazing on public lands from spring through fall. Sixteen (16) grazing allotments extend throughout the project area.

Approved Developments

A number of developments that are in varying stages of implementation have been approved by San Miguel and Montrose Counties, the Towns of Telluride and Mountain Village, and federal land management agencies. The socioeconomic section of this EIS, Section 3.11, describes the overall future development trends within the region. Within the project area, approved developments are located primarily in San Miguel County and consist of residential subdivisions and the Ilium Business Park. ***Plate LAND-3*** illustrates the location of the alternative corridors in relation to approved developments. Approved developments crossed by the alternative corridors in the Norwood area include the Norwood Garden Estates, Pioneer Village, Timberline View Subdivision, La Mesa and Hillside Subdivisions and Beaver Pines. Subdivisions crossed by the alternative corridors further to the east on Specie Mesa and Wilson Mesa are Specie Mesa Ranch, Top of the World, Specie Ridge, Wilson Mesa Ranch and Ptarmigan Ranch.

The Ilium Valley Business and Industrial Park (Business Park) lies at the eastern edge of the project area within San Miguel County's Lawson Hill Planned Urban Development (PUD). A wide range of land uses is acceptable, including Heavy Commercial (HC) and Low Intensity Industrial (I) Zone Districts. Long range plans for the Business Park include expansions to the existing San Miguel County Detention facility and the County's refuse transfer station (Knox 1998: pers. comm.). In addition, thirteen new transient housing units are proposed adjacent

to the existing employee housing (Knox 1998: pers. comm.). The locations of approved developments are shown in ***Plate LAND-3***.

ADOPTED PLANS AND POLICIES

Management plans and policies have been adopted for public and privately owned land within the project area. Adopted plans, management directions, and relevant policies of the Forest Service, BLM, State of Colorado, San Miguel and Montrose Counties are discussed in this section. ***Plate LAND-4*** highlights the adopted designations and management directions that apply to the project area.

FOREST SERVICE - UNCOMPAHGRE NATIONAL FOREST

National Forest lands within the project area are managed in accordance with the *Amended Land and Resource Management Plan for the Grand Mesa, Uncompahgre, and Gunnison National Forest* (Forest Plan 1991). The 1991 Forest Plan addresses all three National Forests jointly, providing a discussion of the existing Forest Service management situation and planned management direction. The 1991 Forest Plan is an Amendment to the original 1983 Forest Plan, however it has been written and organized as a "standalone" planning document, incorporating the 1983 direction and management goals. The 1991 Plan takes into consideration timber management data and direction developed after the 1983 Forest Plan was adopted.

The primary objective of the 1991 Forest Plan is to guide all natural resource management activities and establish management standards and guidelines for the Grand Mesa, Uncompahgre and Gunnison National Forests for up to 15 years (1991 Forest Plan, page I-2). The Plan was implemented as of fiscal year 1991 and will be effective until year 2006, with Plan reviews and possible updates every five years.

The Forest Plan has 20 designated Management Areas, each with a different management focus based upon resources and opportunities, and each having its own Management Prescription. The land use project area encompasses Management Area 2B, shown in ***Plate LAND-4***. Area 2B is managed as follows:

"Management emphasis is for rural and roaded-natural recreation opportunities. Motorized and nonmotorized recreation activities such as driving for pleasure, viewing scenery, picnicking, fishing, snowmobiling and cross-country skiing is provided for in design and construction of facilities. Motorized travel may be prohibited or restricted to designated routes to protect physical and biological resources.

Visual resources are managed so that management activities maintain or improve the quality of recreation opportunities. Management activities are not evident, remain visually subordinate, or may be dominant, but harmonize and blend with the natural setting. Landscape rehabilitation is used to restore landscapes to a desirable visual quality. Enhancement aimed at increasing positive elements on the landscape to improve visual variety is also used.

Scenic byways will be a special emphasis within this prescription. They will provide passenger car activities along with scenic, cultural and historic routes on the Forest. The primary objective will be to showcase outstanding National Forest scenery and increase public awareness and understanding of National Forest activities.

The harvest method by forest cover type is clearcutting in aspen and lodgepole pine, shelterwood in interior ponderosa pine, mixed conifer and Englemann spruce-subalpine fir."

The Forest Plan also contains Management Prescription 1D, which specifically addresses transmission corridors. The primary objective of this prescription is to provide corridors that blend with the local environment and are compatible with the management goals of the management

areas through which they pass. The management activities, direction and standards relative to utility corridor construction and design are provided in *Table 3.8-1*.

BLM - Uncompahgre Field Office Area

Land use plans and policies for public BLM lands in the project area are regulated by the *San Juan/San Miguel Resource Management Plan and Environmental Impact Statement* (EIS). The Resource Management Plan (RMP) and Final EIS (FEIS) were completed in December 1984, with a Record of Decision approved in September 1985. The Final Resource Management Plan (Final RMP) and FEIS provide the basic guidelines for the BLM's management of approximately one million acres of public lands, including that portion within the project study area. The Final RMP and FEIS evaluated four alternatives: The Current Management Alternative; The Resource Conservation Alternative; The Resource Utilization Alternative; and the Preferred Alternative. The Preferred Alternative was selected, which balances the provision of goods and services with the need to protect important environmental values.

Table 3.8-1
Forest Service Management Prescription 1D

Management Activities	General Direction	Standards and Guidelines
Visual Resource Management	Design and construct utilities to harmonize with the landscape.	Use "National Forest Landscape Management," Volume 2 – Utilities for principles and concepts.
Silvicultural Prescriptions	Manage forest cover types consistent or compatible with adjacent management areas. Provide required electrical clearances and minimize the visual impact of the utility right-of-way.	None Listed
Special Use Management Non-Recreation	Transportation and utility corridors must be compatible with the Management Area goals through which they pass.	Corridors shall be designed using the definitions and process established in FSM 1922.51.
Rights-of Way and Land Adjustments	Design, construct and maintain electrical transmission lines in accordance with the rules of the National Electrical Safety Code (NESC), ANSI. Unless otherwise indicated on the plan and profile drawings, all construction and clearances of the transmission line shall conform to the latest edition of the NESC, ANSI issued by the American National Standards Institute.	None Listed

Source: Forest Plan 1991, pages III-97 and 98.

One of the management guidance directives is applicable to proposed utility and transportation corridors. Specifically, the guidance states:

All public land is generally available for utility and transportation corridor development; exceptions will be based on considering the criteria listed below. Applicants will be encouraged to locate new facilities within existing corridors to the greatest extent possible. Public land within areas identified as unsuitable will not be available for utility and transportation corridor development (see Table 1-1 Final RMP/FEIS page 1-4). *Exceptions may be permitted based on considering types of and needs for proposed facilities; conflicts with other resource values and uses, including potential values and uses; and availability of alternatives and/or mitigation measures.* (Final RMP/FEIS, page 1-14).

The Final RMP defines the long-term direction for managing the public lands and describes the required activities to achieve the management goals. The RMP includes Multiple Use Emphasis Areas, A through L, and describes the various management practices and guidelines to be used in administering the public lands and minerals. The Emphasis Areas describe what uses would

or would not be allowable by providing general guidance, as well as specific direction in some instances. Each Emphasis Area addresses the management direction for the following resources and land uses: Cultural, Recreation, Wildlife, Livestock Management, Forestry, Minerals, Lands, Soils and Water, Fire, and Access. Discussion relative to allowed utility infrastructure is found within the management direction for the issue of Lands. The Emphasis Areas occurring within the project area are shown in ***Plate LAND-4,*** and *Table 3.8-2* provides a summary of the Lands Management Direction for the five Emphasis Areas crossed by the alternative corridors.

Several years after the adoption of the Final RMP and the Final EIS, the Nature Conservancy submitted a public nomination for a new Area of Critical Environmental Concern (ACEC) on the San Miguel River between Placerville and Horsefly Creek. As a result, an Amendment to the RMP was prepared in 1990-1991 that addresses the San Miguel River ACEC and Special Recreation Management Area (SRMA). The proposed nomination included the designation of the San Miguel River, from Placerville to Horsefly Creek, and its tributaries as an ACEC, and the area from Deep Creek to Piñon as a SRMA (See ***Plate LAND-4.***) The SRMA was organized into three areas: one area was designated L1, which constitutes the ACEC; and the two remaining areas were designated C1 with an emphasis of managing recreational resources and protecting riparian and scenic values. Like the previously addressed Multiple Use Emphasis Areas, these two management areas have general guidance and specific management direction relative to proposed utility corridors. The guidance and direction are provided below in *Table 3.8-3.*

Table 3.8-2
BLM Multiple Use Emphasis Areas
Lands Category

Emphasis Area	General Guidance	Specific Management Direction
A – Livestock Management	Major utility corridors would be allowed with protective stipulations to prevent or limit impacts to range management.	(No Specific management direction).
B – Emphasis on Wildlife	Major utility corridors would generally be excluded except on a case-by-case basis depending on site-specific impacts of the proposal.	(No Specific management direction).
G – Emphasis on General Natural Resources Management	Major utility corridors would be allowed with protective stipulations to prevent or limit adverse impacts to other resource values.	(No Specific management direction).
H – Emphasis on Public Land Disposal	Major utility corridors would be allowed.	Allow approx. 21,700 acres for land disposal (through sales, exchanges, or any other title transfer means).
J – Emphasis on Forestry and Wood Products	Major utility corridors would generally not be allowed in commercial forests but would be allowed in woodland; exceptions could occur with specific analysis.	(No Specific management direction).

Source: BLM, San Juan/San Miguel Resource Management Plan Amendment; San Miguel River ACEC and SRMA, 1991.

In addition to the RMP and San Miguel River ACEC and SRMA Amendment, the BLM has adopted two additional plans that affect the management of public BLM lands within the project area. Rangeland Health Standards were adopted in 1997 and the Uncompahgre Field Office Fire Management Plan was adopted in 1999.

Five rangeland health standards are applied to BLM lands: Standard 1 applies to upland soils; Standard 2 pertains to riparian systems; Standard 3 applies to healthy, productive plant and animal communities; Standard 4 pertains to special status, threatened and endangered species (federal and state) and other plants and animals officially designated by the BLM; and Standard 5 addresses water quality of all water bodies. Additional information on resources

that are applicable to each of these standards are found in Section 3.4 Soils, 3.5 Water Resources, and 3.6 Biological Resources.

The Fire Management Plan lays the foundation for all fuels management activities in the Uncompahgre Field Office. The plan established the following Fire Management Objectives:

> ***Category A*** are areas where fire is not desired at all. These areas would include ecosystems where fire never played a significant positive role in the function of the ecosystem, or where suppression is required to prevent direct threats to life or property. Areas included in Category A are mature cottonwood and Ponderosa Pine communities adjacent to the San Miguel River, and Bald Eagle roosting trees.

Table 3.8-3
Multiple Use Emphasis Areas
ACEC and SRMA Land Use Category

Emphasis Area	General Guidance	Specific Management Direction
L1 – Area of Critical Environmental Concern	All land use authorizations will be designed to mitigate impacts to recreation and riparian system values. Acquisition of lands will be considered when opportunities for recreation and riparian management would be enhanced. Land would be considered for disposal on a case-by-case basis. Although the intent of this management area is to retain lands in public ownership, disposal that enhances the management goals of the management area, and serves the public interest may be considered. Disposal may occur through exchange, boundary adjustment, and Recreation and Public Purposes Act conveyances.	The area is closed to the development of major utilities (defined in the original RMP), with the exception of the areas described below. Utility corridors, to be used only for major overhead electric transmission lines, will be established across Beaver Creek and Saltado Creek. As requested by San Miguel Power Association, 1 one of these corridors will ultimately be selected for use. The remaining 1 will be closed to major utility development. The corridor selected for use would be available for only 1 overhead transmission line. The corridors are located one-fourth mile on each side of San Miguel Power's existing 69 kV line, and one-half mile on either side of the Beef Trail Road crossing Beaver Creek. The lines must span the riparian area to prevent disturbance to the riparian and aquatic resources of the streams. Visual impacts of line construction must be minimized to comply with VRM guidelines. Stipulations will be developed on a specific project basis to protect natural and scenic values. Within San Miguel Canyon upgrades of the existing major electric transmission lines would be authorized.
C1 – Emphasis on Recreation (for the SRMA)	All land use authorizations will be designed to mitigate impacts to recreation and riparian system values. Acquisition of lands will be considered when opportunities for recreation and riparian management would be enhanced. Land would be considered for disposal on a case-by-case basis. Although the intent of this management area is to retain lands in public ownership, disposal that enhances the management goals of the management area, and serves the public interest may be considered. Disposal may occur through exchange, boundary adjustment, and Recreation and Public Purposes Act conveyances.	The area would be open to major utility corridors, subject to VRM guidelines. The area downstream of Horsefly Creek would be open to major utilities until construction and maintenance impacts to the riparian zone reach 5 percent of the total riparian acreage.

Source: BLM, Resource Management Plan Amendment; San Miguel River ACEC and SRMA, 1991.

Category B pertains to areas where wildfire is not desired. These are ecosystems where an unplanned ignition could have negative effects without mitigation. Category B landscapes encompass the San Miguel Canyon, and areas of urban interface - including recreation structures and facilities, historic structures, communication sites, substations and compressor stations.

Category C are areas where fire is desired but where they may be social, political, or ecological constraints that must be considered. Category C areas encompass habitats for sage grouse, deer and elk calving.

Category D are areas where fire is desired and there are few to no constraints to its use (BLM 1999).

State of Colorado Lands

The federal government transferred ownership of the trust lands to the State when Colorado was granted statehood in 1876 (Colorado State Land Board (CSLB 1993). Revenues from rents, mineral royalties and land sales are used for the benefit of public schools and several other smaller trusts. The Board of.Land Commissioners administers the state school and other trust lands, which total approximately three million surface acres and 4 million acres of subsurface mineral rights. The trust lands are not public and are managed to promote revenues and preserve long-term productivity and value (CSLB 1993). As shown in ***Plate PROJECT-1***, trust lands in the project area are found south of Redvale and on Wilson Mesa.

The State of Colorado administers a stewardship program for state lands with significant natural values. The Wilson Mesa Parcel (Section 36, T43N, R11W), which is leased by M.J. Cadgene, was jointly nominated by San Miguel County and M.J. Cadgene for inclusion in the State's Stewardship Trust program. The parcel was officially designated into the Stewardship Trust program in early 1999 (Bedford 1999: pers. comm.). The San Miguel County Board of Commissions determined that the parcel was threatened by potential development and should be managed under the stewardship program to protect its natural, open space and wildlife values (SMC 1998). Moreover, Elk Creek, which flows through the parcel, is an important habitat for a relatively pure strain of Colorado Cutthroat Trout (SMC 1998).

Montrose County

Montrose County adopted the *Uncompahgre Valley Master Plan* on June 28, 1989. This plan only addresses the Uncompahgre Valley portion of the county and none of the lands within the project area. The County is currently is the process of updating the Master Plan, which should be adopted in late 2001 or early 2002. Current zoning in the project area is primarily General Agriculture, which allows for a wide variety of uses. Transmission lines and substation facilities are not prohibited from this zone, although a Special Use Permit for the Project would be required from the County. The Project would be subject to review and approval by the County as part of the processing of the Special Use Permit application.

San Miguel County

County-Wide Policies. Land and resource planning for the county is guided by the goals and objectives in the *San Miguel County Comprehensive Development Plan* (adopted in 1978 and amended in 1998), and the adopted Land Use Plan designations. Development implementation is enforced through the *San Miguel County Land Use Code* (March 1997). In addition, the County has specific guidelines for siting of utilities and utility lines throughout the County. These policies are stated as follows:

It is the policy of San Miguel County to try and locate public utility lines on lands that create the least amount of impact on the residents of the County and the natural environment. In order to do this in an

orderly and equitable manner, the County has established a land classification system, with each class of land having an assigned priority as to its suitability for locating utilities and utility lines... It is the County's policy to try and locate utility lines and utilities on Class 5 Priority lands. Any proposal to utilize other priority lands shall demonstrate a clear need to do so and shall consider the visual, environmental, physiographic, and socioeconomic characteristics of the land including evaluation of broad ecosystems, topography, soils, hydrology, geology, vegetation, wildlife, climate and unique features so that the siting of utilities and utility lines results in the least possible adverse impact. (CDP 1998)

The San Miguel County Comprehensive Development Plan (CDP) defines the Class 5 Priority land as "All public and government lands, and all other lands not falling within the definition of Class 1, 2, 3, or 4 priority." (CDP 1998). The Class 1-4 Priority lands are not recommended for placement of utilities based upon this County policy. These four Class Priorities are summarized in *Table 3.8-4*.

Table 3.8-4
San Miguel County
Class 1-4 Priority Lands

Class Priority	Designated Land Use
Class 1	Cemeteries, airports, private and emergency landing strips, future airport sites, and approach and take off areas.
Class 2	Intensive cropland, including irrigated farms, meadows, irrigated pasture land, cropland used for dry land culture, lands along valley floors intermingled with cropland, farm and ranch headquarters and storage points.
Class 3	Unincorporated land zoned residential, multi-family residential, and commercial in which public utilities are a permitted use; lands containing or having significant impact on historical, natural, or archaeological resources, shorelines of major lakes or reservoirs, natural streams and ponds, skylines visible from major transportation routes, geologic hazard areas and critical wildlife areas.
Class 4	Timbered areas that would require modification or removal to provide clearance for utilities or utility lines; land within the boundaries of approved developments and land suggested as future growth areas around existing communities.

Source: San Miguel County Comprehensive Development Plan, 1998.

Planning Area Designations and Guidelines. Due to the size of San Miguel County, the distance between the more highly populated areas and the federal lands scattered throughout the county, the goals, objectives and planned land uses are organized into four primary areas: San Miguel Canyon Area, Wrights Mesa Area, Telluride Regional Area, and the Remainder of the County. Portions of all four of these areas fall within the project area.

San Miguel Canyon Area. The San Miguel Canyon Area generally follows the San Miguel River between the western edge of the Telluride Region and the base of Norwood Hill, which is located south of the river and south of the San Miguel/Montrose county line. The two towns within the San Miguel Canyon Area, Sawpit and Placerville, retain most of this planning area's commercial land uses. Development goals and objectives have been formulated for the following land uses: Residential, Commercial, Public Lands, Utilities and Facilities, Transportation, and Economic Development. The Utilities and Facilities Goal is "To develop and maintain public utility service systems and public facilities to serve the existing and potential population." The Objective for the Utilities and Facilities land use designation is to "Encourage creation and upkeep of public utility systems necessary to maintain public health, safety and welfare" (CDP 1998).

Wrights Mesa Area. Wrights Mesa Area includes the town of Norwood and the general vicinity around the town. Like the San Miguel Canyon Area, Wrights Mesa Area has goals and objectives for the following land uses: Agriculture and Natural Resources; Commercial/-

Industrial; Transportation, Communication and Utilities; and Public and Semi-Public. In addition, Economic Development goals and objectives were formulated to provide a framework for growth in this area. The Economic Development objectives for this area focus on encouraging a diversified economy and preserving and maintaining the existing agricultural base and service economy. An additional objective is to "Maintain services and facilities to support tourism and recreation adequately."

The Wrights Mesa Area also has goals and policies specific to public utilities and services. The primary goal is to "Provide for future needs of the community with respect to utility services and facilities." (CDP 1998) Policies relative to this goal include the requirement that all public utility feasibility studies include consideration of the present and future local energy demands, and interstate and trans-county utility transmission lines are installed in a manner that protects scenic corridors and mitigates adverse impacts on residents" (CDP 1998).

Telluride Regional Area. The Telluride Regional Area land use goals, objectives and policies are found within the *Telluride Regional Area Master Plan* (Master Plan 1989) which is an Amendment to the *San Miguel County Comprehensive Development Plan* (CDP 1998) and contained therein. One of the Forecast and Projections statements in the Master Plan states that "Current zoning fails to designate sufficient areas in the Region which are appropriate to be used to meet the operational and service needs of the providers of other utilities, i.e. telephone, electric and gas. Specific areas need to be identified within the Telluride Region to meet the needs of companies which provide these services." (Master Plan 1989) Scenic Quality Objectives within the Master Plan include one objective specific to future utility projects: "Encourage the undergrounding of the power lines which will serve future development." (Master Plan 1989) The Utilities Land Use Objectives address future utility projects in several different objectives; stated as follows:

- Coordinate the provision of public utilities with existing providers of those utilities.
- Prevent the proliferation of special districts and private central utility facilities when existing public facilities are available or can be made available within a reasonable time frame from an existing provider at a reasonable cost.
- Avoid the extension of utilities into areas that are deemed inappropriate for development based upon an evaluation of the proposed development against the goals and objectives of the Telluride Regional Area Master Plan.
- Require the undergrounding of utilities within the Telluride Service Area.

Remainder of the County. Many of the planning objectives and goals for the remainder of the county are a combination of attitudes and values expressed by residents residing within small communities located within the planning area. The overall goals include promoting and maintaining an atmosphere in which communities can retain their uniqueness and viability. Siting of utility lines within the remainder of the county are to occur on Class 5 Priority lands (CDP 1998).

San Miguel County Land Use Code The *San Miguel County Land Use Code* provides direction and policies pertinent to that portion of the project that would be located in San Miguel County. As part of the two-step process currently under way, Tri-State is seeking a Public Utilities Structures Special Use Permit, a Wetland Special Use Permit and a 1041 Permit for Areas and Activities of State and Local Interest to construct and operate the proposed 115 kV transmission line. Land Use Code Sections 5-709 sets forth the standards for the Board of County Commissioners and the County Planning Commission to use in reviewing land use applications for 'Public Utilities Structures and Electricity Transmission and Distribution Lines'. Review Standards for Special Uses in the WM, WE, F zone districts are contained in LUC Sections 5-319, 5-320, and 5-1002. LUC Code 5-2203 sets forth the review standards for reviewing wetland special use permit applications. LUC Section 5-4 addresses areas and

activities of Local and State Interest/"1041". The 1041 Environmental Hazard Review addresses environmentally sensitive and hazardous areas, including assurances for mitigation. LUC Section 2-12 addresses scenic quality issues.

ONGOING FEDERAL, STATE AND LOCAL PLANNING ACTIVITIES AND PROPOSED DEVELOPMENTS

This section addresses federal, state and local planning activities and pending developments that are in the planning stages. These actions and projects are considered reasonable and foreseeable and have been considered in the Cumulative Effects sections of this EIS. ***Figure LAND-6*** shows the general locations of most of these activities and plans.

FEDERAL AGENCIES' PLANNING ACTIVITIES AND PROPOSED PROJECTS ON FEDERAL LANDS

The following programs and projects may affect National Forest and/or BLM lands in the vicinity of the proposed transmission line alternatives:

Uncompahgre National Forest Travel Plan. The Forest Service completed a *Final Environmental Impact Statement* in April 2000 that evaluates proposed revisions to the existing *Uncompahgre National Forest (UNF) Travel Plan* (1984). The eastern extent of the proposed Tri-State Powerline upgrade lies within and/or near portions of the Mountain Division of the UNF (i.e. National Forest lands near the alignment of the line across Specie, Wilson and Sunshine Mesas, and Ilium Valley).

The purpose of a travel plan is to provide safe access to and through the Forest, to provide a variety of recreation opportunities for public users, and to support resource management (*e.g.*, timber harvest, livestock grazing, mineral exploration and development, and special uses). A revised Travel Plan would address current and anticipated travel demands on the Uncompahgre National Forest (UNF) for off-route travel, and for travel on roads that extend beyond primary roads in the Forest. Such a plan would also address access needs for construction and maintenance of facilities such as Tri-State powerlines administered under special use permit.

A decision was made in April 2000 to implement Alternative 3 of the FEIS, which would provide a mix of recreational opportunities in balance with other resource concerns and management needs. This decision was appealed on the basis of procedural flaws under NEPA and NFMA. The Regional Forester, while supporting the basic intent of the new Plan, vacated the decision with instruction to promptly begin a new decision process that would remedy the procedural deficiencies. This effort is underway and entails the amendment of Forest Plan standards related to wildlife habitat capability. A new Uncompahgre Travel Plan decision is expected in the Autumn of 2001.

Forest Service Fire Management Program. The Forest Service's Fire Management Program is a coordinated interagency effort involving the State of Colorado, BLM and local governments (Final RMP 1991). Fuel treatment to reduce fire hazards is accomplished by removal of excess trees, salvaging of dead and down material, and prescribed burning. Two prescribed burns are planned within the land use project area, one of which will occur south of the community of Redvale, and the other is planned adjacent to the Montrose/San Miguel County boundary (*Plate* LAND-4). The agency burns are planned from 1999 through 2010 (Barth 1998: pers. comm.).

Recreation Improvements Planned on the Uncompahgre National Forest. Improvements currently planned or recently completed by the Forest Service include 1) Sunshine campground reconstruction; 2) extension of Sneffels High Line Trail (east of existing trail); 3) extension of the Galloping Goose Trail along the railroad grade to Placerville as part of Skyway Trail; 4) expansion of the Telluride Ski Area; and 5) construction of the final segment of the Galloping Goose Trail between the underpass and Matterhorn Campground.

Recreation Improvements Planned on BLM Lands. Improvements currently planned or recently completed by the BLM include 1) construction of the Leopard Creek interpretive turnout/ trail/parking on the Leopard Creek/SH 62 corridor northeast of the intersection on SH 145; 2) construction of Leopard Creek Trail as part of Skyway Trail; 3) Norwood Hill Recreation Site/Living Classroom; construction of toilets, group picnic pavilion, and reconstruction of existing cabin on-site; 4) Applebaugh county park with playing fields, picnic shelter, restrooms, boater take-out (in coordination with San Miguel County); 5) Piñon Bridge boater take-out improvements and Ledges Campground; 6) Beaver Creek camping area with boat launch; and 7) fisherman access parking between Sawpit and Deep Creek.

Ski Area Expansion. The Telluride Ski & Golf Company (Telski) has proposed to expand its current ski operations within the Forest Service's special use permit area around the Town of Mountain Village. A number of documents have been prepared to evaluate the potential environmental effects of Telski's proposal, including the *Draft Environmental Impact Statement Telluride Ski Area Expansion* (March 1994), the *Final Environmental Impact Statement Telluride Ski Area Expansion* (February 1996), *Telluride Ski Area Expansion Draft Record of Decision and Conformity Determination* (February 1996), and the *Draft Supplement to the Final Environmental Impact Statement for the Telluride Ski Area Expansion* (October 1998). The Final Supplement to the Final Environmental Impact Statement and ROD was issued in June of 1999. Telski's major objective is to provide new and improved ski facilities, increase the size and diversity of their existing resort, and enhance amenities of the overall area in order to assure and optimize economic return on their investment. Implementation of the ski area expansion is currently in progress.

San Miguel Hydroelectric Project. The Town of Telluride filed an application in 1985 for a license from the Federal Energy Regulatory Commission (FERC) for the proposed San Miguel Hydroelectric Project. An Environmental Assessment (EA) was conducted jointly by FERC and the Forest Service in 1991 (FERC 1991). The Project is planned on 2.4 acres along the San Miguel River in the vicinity of Ilium Valley (***Plate LAND-4***). A Special Use Permit was granted to the Town of Telluride in May 1994 for construction, operation and/or maintenance of the hydroelectric project. The Special Use Permit subsequently expired but was reinstated with the condition that construction of the project would commence by January 30, 2002 (Stuller 1999: pers. comm.).

The San Miguel Watershed Plan. The *San Miguel Watershed Plan* (Watershed Plan 1998) was developed by the San Miguel Watershed Coalition, with the purpose of assisting San Miguel Basin residents and resource managers in making decisions regarding the future of the San Miguel Watershed. The Plan's objectives include providing affordable housing in Telluride, maintaining the Basin's rural character, diversifying the Basin's economy, promoting water conservation and managing water sources, and protecting important plant and animal habitats.

State Programs, Telluride Area

Highway Improvements in the Study Area. *Colorado's 20 Year Transportation Plan* was adopted by the Colorado Department of Transportation in January, 1996. The existing Plan is a consolidation of 15 Regional Transportation Plans (RTPs) that have been integrated into one comprehensive statement of transportation needs and priorities that exist throughout the State of Colorado. A number of transportation-related improvements to SR 145 are planned by CDOT. Within the project area, improvements include: construction of shoulders and passing and turn lanes between Placerville and Society Turn by 2006; construction of a 'roundabout' at Society Turn (Braaten 1999: pers. Comm.); construction of 3 employee houses at the CDOT Telluride Maintenance facility at Lime, between the SR 145 maintenance yard and San Miguel River (Jacobson 2001, pers. Comm.). CDOT is also in the process of realigning the intersection of State Highway 145 and South Fork Road.

County Programs and Plans

Land Use and Transportation Report. The Citizen Planning Advisory Committee (CPAC) prepared the *Telluride Area Land Use and Transportation Report* (October, 1998) as an "...effort to modify the January 1997 Telluride Region Growth Management and Transportation Preferred Alternative." CPAC was established in March 1997 by the Telluride Town Council and San Miguel County Board of Commissioners. CPAC has formulated recommendations pertaining to land use patterns within the Telluride area, as well as to population density, the transportation system, air quality, community character, environmental protection, and the financial and economic impacts of implementing their recommendations. Future land use and patterns of development formulated by CPAC are intended to: 1) protect the environmental systems and setting of the region; and 2) focus new development to promote a sustainable, unique, and environmentally respectful community within a tourism-based economy. (See Socioeconomics, Section 3.11, for additional information).

San Miguel County Park and Recreation Plans. San Miguel County has several proposed recreation plans for lands within or near the alternative corridors. These plans include the extension of the Galloping Goose Trail west of Ilium, and development of a county park on the Applebaugh Property near Fall Creek. The Telluride Trails Council is planning to extend the Galloping Goose Trail from Ilium to Placerville. The trail would be used primarily for biking and hiking.

The County of San Miguel, in cooperation with the BLM, also plans to develop a county park on the Applebaugh property in Fall Creek. The Applebaugh property is 47 acres; 12 acres will be developed as a county park and the remaining acreage will be acquired by the BLM through a land exchange. Preliminary plans for the park call for a combination of recreation activities and the restoration of an ecologically damaged area near the San Miguel River. Recreational facilities tentatively planned for the park include parking for boaters and a path to a boat put-in, a combination baseball/soccer field, picnic areas, children's play area, a trail system, a kayak slalom course, fishing access and Nordic ski trails. The County plans to acquire the property this fall, and could start construction by next summer (Thurston 1999).

3.8.2 ENVIRONMENTAL CONSEQUENCES

3.8.2.1 ANALYTICAL FRAMEWORK

Potential Types of Impacts

Section 3.8.2 describes the potential direct and indirect effects to existing and planned land uses that may result from the construction, operation and maintenance of the project alternatives. Existing land uses may be directly affected if the project facilities or easement restrictions resulted in structures or uses being removed or relocated; or if existing land use activities or operations would need to be modified or curtailed. Tri-State's typical easement restrictions for high voltage transmission lines are contained in Appendix A of the EIS. Direct impacts may also result if the Project and easement restrictions require long-term changes to future land use plans or development options. Conflicts or inconsistencies of the Project with adopted federal, state and local plans and policies would also represent direct land use-related effects.

Land uses may be affected indirectly in a number of ways that are described elsewhere in this EIS. Indirect impacts to existing land uses could entail degradation to land use settings or uses resulting from short-term construction effects of dust, noise, and traffic or long-term impacts associated with visual changes, increased exposures to electrical and magnetic fields, and reductions in land values. Short-term indirect dust, traffic, and noise effects are discussed in

Sections 3.2, 3.12 and 3.13, respectively, of this EIS. Visual effects, land value issues, and human health and safety concerns are discussed in EIS sections 3.10, 3.11 and 3.14, respectively. The reader is also directed to Section 3.3 (Geology, Paleontology and Minerals) and Section 3.9 (Recreation) for discussions of potential project effects to these issues.

With respect to existing and planned land use impact issues described in this section, the following general factors were considered in evaluating the degree of potential project-related effects:

- Whether the proposed Project would alter or otherwise physically affect established, designated, or planned land uses;
- If the construction and operation of the proposed facilities would be inconsistent with adopted plans and management goals of the community or area in which they are located. For instance, plans and policies established by the Forest Service, BLM, State of Colorado, and San Miguel County pertaining to utility corridors; and,
- If the Project would disrupt or divide the physical arrangement of an established or proposed community or public or private land use, or indirectly impact other public facilities.

Within the project area the types of existing land uses potentially affected by the project alternatives include existing residences, platted subdivisions (*i.e.*, residential, commercial and industrial), irrigated agriculture including prime and unique farmlands, air facilities, and open space used for livestock grazing, ranching and controlled burning. Planned land use issues pertinent to the project alternatives include whether the Project is compatible with the Forest Service, BLM, State of Colorado and local county plans and ordinances, and any conflicts with future planning activities and programs. Specific issues evaluated for this Project include:

- Construction activities and access roads that may diminish crop productivity from one to three seasons. Presence of transmission structures in fields may result in long-term removal of cropland from production, increased weeds in fields, disruptions and conflicts with existing irrigation systems, and increased farming time to operate equipment around structures;
- Construction and maintenance operations that may impose short-term impacts to landowners, including rutted roads and gate openings;
- Presence of structures and conductors in existing or planned sand and gravel extraction or energy production areas (*i.e.*, the proposed San Miguel Hydroelectric Project near Ilium Valley) that may limit development options or necessitate the relocation of electrical structures at a later date. Presence of structures and conductors could displace, alter or otherwise physically affect energy and mineral extraction related facilities;
- Right-of-way easement restrictions that may require the removal of buildings, including residential improvements, or may limit land uses and development options during the life of the Project;
- The presence of project facilities in areas planned for residential development that may adversely affect development potential of these lands; and
- Construction of the project facilities that may conflict with established plans and management policies adopted by federal, state and local agencies, including the Forest Service's Management Prescriptions, the BLM's Management Emphasis Areas, and San Miguel County's Class 1-4 Priority Areas.

Definitions of Impact Levels

Potential impacts to land uses from the proposed Project were evaluated qualitatively according to High, Moderate and Low levels. The three impact levels are defined as follows in this EIS:

High Impacts - High impacts would occur if the proposed Project results in the cessation or removal of land use activities or structures that are important to the social or economic base of the region, are unique, or are substantially limited or natural in the region. High impacts were identified if, and where, the following conditions were encountered:

Existing Land Uses

- If established residences would be situated within the project right-of-way. Direct long-term effects could occur if residences were required to be removed from the right-of-way.
- If the Project would directly impact other established land uses of local social or economic importance, such as commercial establishments, cemeteries or public facilities.
- If the Project would directly impact prime farmlands or irrigated agricultural fields by crossing diagonally or through the center of fields rather than along field or property boundaries. Project facilities could directly conflict with irrigation structures and activities as well as result in the long-term loss of productive prime farmland.
- If the Project would directly or indirectly conflict with airports, airstrips or FAA approved approach zones.

Planned Land Uses

- If the Project would directly conflict with adopted plans and policies of the BLM, Forest Service, San Miguel or Montrose Counties regarding the siting of powerlines. Examples include if the Project would encroach through San Miguel County's Class 1, 2 or 3 priority lands, as defined in the County's Comprehensive Development Code.
- If the Project would establish a new utility corridor through planned residential or commercial developments that have been approved or are pending approval by the counties.
- If a new transmission corridor is established through the San Miguel River Special Recreation Management Area (SRMA) designated by BLM as Management Emphasis Area C1. The BLM identifies recreation as the principal management objective within Area C1. In addition, BLM's Management Guidance states that the SRMA would be open to major utility corridors, subject to Visual Resource Management (VRM) goals. Specific impacts associated with recreational and visual resources are discussed in Sections 3.9 and 3.10, respectively.

Moderate Impacts - Moderate impacts were assessed if the project right-of-way easement agreement would restrict or limit land use options and activities. The following situations represent moderate impacts:

Existing Land Uses

- If the Project would directly or indirectly impact irrigated agriculture due to the right-of-way location along property/field boundaries.
- If residences would be adjacent (within 300 feet) to an alternative corridor alignment. In these instances, potential indirect impacts to the quality, access, or functionality of residential lands may occur.
- If the project easement restrictions would require landowners to relocate ancillary ranching and farming facilities such as corrals, fences, etc.
- If the Project would obstruct the operations or future expansion of mining claims or gravel operations.

Planned Land Uses

- If the Project would cross the San Miguel River ACEC within the existing utility corridor. The ACEC is closed to the development of new utility corridors, but upgrades of the existing major electric transmission lines would be authorized. Short-term impacts associated with rebuilding the existing line across Beaver and Saltado Creeks were assessed as moderate.
- If a new or existing corridor was to conflict with prescribed burn areas designated by the Forest Service, BLM and State of Colorado, or with the BLM's Fire Management Program.
- If a new corridor or the rebuild/upgrading of an existing line would cross National Forest lands designated Management Area 2B in the Forest Plan. Short-term impacts could be associated with the construction phase, but long-term visual impacts would result from right-of-way clearings or ground disturbance where distribution lines are undergrounded.
- If the Project were located in San Miguel County's Class 4 priority lands, as defined in the County's Comprehensive Development Code.
- If rebuilding or upgrading the existing line would degrade land designated as open space in the Telluride Land Use and Transportation Planning Area.
- If the Project would increase access through BLM's Wildlife Emphasis Area B (*e.g.*, Bar, Bdew and Be) and potentially result in the degradation of wildlife habitat.
- If the Project would upgrade an existing utility corridor through lands that have been planned and approved for residential or commercial developments

Low Impacts - Low impacts were assessed to private and public lands where the proposed Project would follow approved/designated or suitable utility corridors. In these areas, the proposed action was assessed to be in conformity with federal, state and local management plans and policies, and was considered to represent a low degree of potential conflict with land management goals and objectives.

Existing Land Uses

Low impacts were assessed to grazing land and associated livestock improvements (*i.e.*, corral, fencing) and ancillary structures that could remain within the right-of-way. These types of land uses could remain within a corridor with proper pole placement to span these features.

Planned Land Uses

- Where the Project would cross BLM's Management Emphasis Area A (Livestock Management). Major utility corridors are allowed with protective measures to prevent or limit impacts to range management.
- Where the Project would cross BLM's Management Emphasis Areas H (Public Land Disposal), G (General Natural Resource Management), or J (Forestry).
- Low impacts are assessed for San Miguel County's Class 5 Priority lands, which are all public and government lands not falling within the definition of Class 1 through 4. It is San Miguel County's policy to try to locate utility lines on Class 5 Priority lands.

Applicable Permits, Standards and Ordinances

Prior to construction the applicants would need to obtain the following land use-related permits:

- Special Use Permit for the Forest Service
- Right-of-Way Grant and Temporary Use Permits, as necessary, for the BLM
- Special Use Permits from Montrose and San Miguel Counties
- Right-of-Way Permit from the State of Colorado

Environmental Protection Measures

In order to minimize the potential for the types of land use effects described above, Tri-State has committed to implementing a number of environmental protection measures that have been incorporated into this analysis. Tri-State's land use-related EPMs are listed in *Table 2.2-4* and include numbers 1, 2, 6, 15 and 16. On public lands, the BLM and the Forest Service would require Tri-State to implement Best Management Practices. BMP's that would reduce potential effects to land use-related concerns are listed in *Table 2.2-5* and include numbers 15, 18, 28 and 29. Tri-State will also be required to provide a CO&M Plan.

3.8.2.2 IMPACTS OF THE PRIMARY TRANSMISSION ALTERNATIVES

This section describes the impacts to existing and planned land uses from construction and operation of the primary project alternatives. *Table 3.8-5* summarizes the land use impacts for the Nucla-Norwood Alternatives.

Nucla-Norwood Northern Alternative

This alternative consists of rebuilding the existing 69 kV to a single circuit 115 kV transmission line between the Nucla Substation and the Norwood Substation. Minor improvements to the Nucla Substation are proposed, while the existing Norwood Substation would be expanded at its existing location. The rebuilt 115 kV line would remain in the same location as the existing 69 kV line (see ***Plate LAND-2, Utility Corridors***). The alternative alignment would cross through approximately 15.0 miles of privately owned land, and about 1.5 miles of public land administered by the BLM. Private lands crossed include approximately 12.6 miles in Montrose County and 3.9 miles in San Miguel County. Although no new access roads would be constructed, SMPA's existing rights-of-way easements for the 69 kV line would need to be widened and/or new easements acquired where they are not presently in place.

115 kV Transmission Line Effects

Existing Land Uses. The Nucla-Norwood Northern Alternative would consist of rebuilding the 69 kV line to 115 kV through agricultural, ranching and residential areas that would be affected directly and indirectly due to the increased easement width and restrictions necessitated by the 115 kV system. Agricultural impacts would consist of increasing and continuing the effects to farming operations and irrigation systems that the existing poles and transmission lines cause in agricultural fields. The 115 kV line would continue to cross approximately 7.1 miles of irrigated pastures and fields. Impacts to agriculture are considered high for 3.8 miles where the line crosses through the center of, or diagonally across, irrigated fields. Prime farmlands would be crossed by this alternative for 4 miles. Impacts to these areas are considered high. Weed infestations, reduced crop yields and increased time to operate farming equipment around poles are some of the long-term effects. Short-term effects may also include loss of crop production and soil compaction during the construction phase. Impacts to irrigation operations are particularly high in instances where the Project would affect fields with wheel-line irrigation systems. Impacts are considered moderate in instances where the Project would cross the edge of a field or along a property boundary, since conflicts with equipment operations and weed infestations can be more easily controlled by landowners.

Table 3.8-5 **Summary of Land Use Impacts - Nucla-Norwood Alternatives**			
Land Use Issues/Impacts	**Nucla-Norwood Northern Alternative**	**Nucla-Norwood Central Alternative**	**Nucla-Norwood Southern Alternative**
Existing Land Uses			
Impacts to Community of Redvale	High - bisects community	No Adverse Effect -- Existing 69 kV line would be retained for distribution service	No Adverse Effect – Existing 69 kV line would be retained for distribution service
Miles of Irrigated Agriculture Crossed	7.1 miles total – high impacts 3.8 miles – moderate impacts 3.3 miles	3.2 miles total – high impacts 0.8 mile – moderate impacts 2.4 miles	0.3 mile total – high impact
Subdivisions Crossed by Alignment/Corridors	Norwood Gardens – moderate impacts Timberline View Pioneer Village – moderate to low impacts	Norwood Gardens – moderate impacts Timberline View Pioneer Village – moderate to low impacts	La Mesa – moderate to low impacts
Miles of Prime Farmlands Crossed	4.0 miles total - high impacts	1.0 mile total	0.0 mile - no identifiable effects
Number of Structures Crossed by the Alignment	7 structures - total – high impacts to 4 residences – moderate to high impacts to other structures	3 structures - total – moderate to high impacts	0 structures - no identifiable effects
Total Number of Homes within 300 feet of Alignment	21 residences - moderate impact	5 residences - moderate impact	5 residences - moderate impact
Total Number of Homes within 0.5 mile of Alignment	166 residences - moderate to low impacts	104 residences - moderate to low impacts	40 residences - moderate to low impacts
Planned Land Uses			
BLM Emphasis Areas Crossed —			
Emphasis A - Livestock Management	Low Impact	Low Impact	Low Impact
Emphasis B - Wildlife Management	Moderate Impact		
Emphasis F - Forestry			Low Impact
Montrose County	No adopted general plan for this part of county.	No adopted general plan for this part of county.	No adopted general plan for this part of county.
San Miguel County – Priority Class Lands Affected –			
Priority Class 2 - Irrigated Farmland/Meadows	2.5 miles - high impact	2.5 miles - high impact	0.3 mile - high impact
Priority Class 3 - Skylines visible from major transportation routes (SH 145)	High Impact - see visual resource section 3.10	Moderate Impact - see visual resource section 3.10	Low Impact - see visual resource section 3.10
Priority Class 3 - Impacts to natural streams and ponds	3 - high impacts 48 - moderate impacts - see water resources section 3.5	9 - high impact 31 - moderate impacts - see water resources section 3.5	9 - high impact 25 - moderate impacts - see water resources section 3.5
Priority Class 3 - Lands having significant cultural resources	Unknown at this time - see cultural resources section 3.7	Unknown at this time - see cultural resources section 3.7	Unknown at this time - see cultural resources section 3.7
Priority Class 3 – Geologic hazard areas	1.7 miles - high impact - see geology section 3.3	5.3 miles - high impact - see geology section 3.3	3.3 miles - high impact - see geology section 3.3

Table 3.8-5 Summary of Land Use Impacts - Nucla-Norwood Alternatives			
Land Use Issues/Impacts	**Nucla-Norwood Northern Alternative**	**Nucla-Norwood Central Alternative**	**Nucla-Norwood Southern Alternative**
Priority Class 3 - Critical Wildlife Areas	Potentially moderate impacts to Mexican spotted owl habitat and Southwestern willow flycatcher habitat. See biology section 3.6	Potentially moderate impacts to Mexican spotted owl habitat and Gunnison sage grouse habitat. See biology section 3.6	Potentially moderate impacts to Mexican spotted owl habitat and Gunnison sage grouse habitat. See biology section 3.6

The 75-foot to 100-foot easement for this alternative would also directly impact a number of residences and related outbuildings. Approximately seven structures would potentially be within the right-of-way and may need to be removed if this alignment were built. Four of these are residences located in Montrose County, west of the community of Redvale (Link 1, mile markers 6.2, 6.9, 7.2 and 7.3). The remaining three structures are in San Miguel County, west and northwest of Norwood, near Link 2, mile markers 1.7, 1.9 and 3.0. Impacts to these structures would be high if they are used, or intended to be used, as permanent residences in the near future. Impacts to Redvale are also considered high since the line would continue to bisect through a central section of the town. There would be indirect, short-term, moderate impacts to 21 residences located within 300 feet of the alignment. An additional 145 residences are within 0.5 mile of this alternative alignment and may also be affected by construction activities. With respect to impacts to subdivisions, the Northern Alternative crosses 6 lots of the Norwood Gardens Subdivision, and the corridor crosses portions of the Timberline View and Pioneer Village Subdivisions.

Impacts to other uses in the area, such as ranching and grazing and several salvage yards, are assessed as low. Short-term disturbances would occur during construction, however, long-term impacts would be minor and not differ from the existing 69 kV line.

Planned Land Uses - Conformity with Adopted Plans and Policies. This alternative alignment crosses public BLM lands and lands administered by Montrose and San Miguel Counties. The Nucla-Norwood Northern Alternative would consist of rebuilding the existing 69 kV line to 115 kV across BLM lands that are designated as Emphasis Area A (Livestock Management) and Emphasis Area B (Wildlife Management - deer and elk winter range). The project construction and operation are considered to represent low to no identifiable conflicts with the BLM's Emphasis Area A lands. Management guidance allows major utility lines within land designated for livestock management, but protective stipulations would be required to prevent or limit impacts to range management. Moderate levels of potential conflict are identified for Emphasis B lands. This alternative would be constructed within an existing powerline easement; and no new access roads would be built. Public BLM lands crossed by the Nucla-Norwood Northern Alternative for 1.5 miles are classified as Fire Management Category B1. Wildfires are not desired in Category B Fire Management Areas. This category is used for areas of urban interface, including electrical substations. The Project is considered compatible with lands classified as Category B.

No impacts with adopted plans and policies are identified for Montrose County, since the County's general plan does not address this part of the county.

With respect to San Miguel County, the Project would cross lands that are identified as Priority Class 2 and 3 (CDP 1998). These include irrigated cropland, pastures and meadows, which are discussed above under existing land use. Approximately 2.5 miles of irrigated agriculture crossed by this alternative are in San Miguel County, and are Priority Class 2. Priority Class 3 lands affected by this alternative include project lands visible from a major transportation route (*i.e.*, SH 145, Unaweep-Tabeguache Scenic Byway) and natural streams

and ponds (See Section 3.5, Water Resources). Potential conflicts with the San Miguel County Comprehensive Development Plan priority classes are considered high for Priority Classes 2 and 3. No impacts with other planned land uses or developments have been identified for this alternative.

Substation Effects

The expansion of the Nucla Substation within the boundary of the existing power plant property would have no impact on existing or planned land uses in Montrose County. No excavation, grading, enlargement of the substation pad, or extension of the fenceline are proposed.

Expansion of the existing Norwood Substation facility from .03 to 2.0 acres would impact undeveloped lands of San Miguel County. No specific conflicts with planned land uses are anticipated since the land is in open space and no other developments are proposed on-site or adjacent to the substation property. The substation would not affect lands that fall within San Miguel County's Priority Classes 1 through 4. Indirect impacts of noise, dust and visual changes would result to a number of residents, located north, east and west of the substation site.

69 kV Transmission Line and Distribution System Effects

No adverse impacts, beyond those previously described for the 115 kV system, would result from changes to San Miguel Power Association's distribution system or the removal of the 69 kV line. Changes to SMPA's distribution would occur in the same location as the 115 kV line and would consist of underbuilding the distribution line on the 115 kV poles in three locations. Each of these sections crosses privately owned land, two are located near Redvale, and the remaining section is north of Norwood (***Plate PROJECT-3***).

Nucla-Norwood Central Alternative

The Nucla-Norwood Central Alternative would cross public lands for 4.2 miles and private lands for 15.3 miles. Private lands of Montrose County are crossed for 11.5 miles, while San Miguel County lands are crossed for 3.8 miles. The proposed alignment would parallel the existing Nucla-Cahone 115 kV line south of the Nucla Substation (***Plate PROJECT- 4***). A new utility corridor with a single circuit 115 kV transmission line would be constructed eastward along the Montrose and San Miguel County border. This new line would converge with the existing 69 kV alignment southeast of Redvale. From this point, the 69 kV line would be rebuilt to a single circuit 115 kV line that would follow the existing corridor to the Norwood Substation. Alterations to the Nucla and Norwood Substations would be similar to those required for the Nucla-Northern Alternative.

115 kV Transmission Line Effects

Existing Land Uses. The Nucla-Norwood Central Alternative would entail crossing 3.2 miles of irrigated agriculture, primarily west of the Norwood Substation. Impacts to agriculture would be high to moderate (see discussion of agricultural-related impacts of the Nucla-Norwood Northern Alternative). For 0.8-mile impacts would be potentially high where fields would be bisected, or where wheel line irrigation would be impacted. In San Miguel County, irrigated agricultural land primarily consists of irrigated pastures and meadows. Prime farmlands would be directly affected for 1.0 mile.

This alternative would also potentially impact up to three structures. These structures are located in San Miguel County, west and northwest of Norwood. Long-term impacts of removing these structures would be high if they are used, or intended to be used, as permanent residences in the near future (Link 2, mile markers 1.7, 1.9 and 3.0). Impacts are

considered moderate if these are ancillary structures that can be moved on the owner's property. There would also be indirect, short-term, moderate impacts to five residences located within 300 feet of the alignment. An additional 96 residences are within 0.5 mile of this alternative alignment and may also be affected by construction activities. The Central Alternative also crosses 6 lots located in the southwest part of Norwood Gardens Subdivision. Impacts to the subdivision are assessed as moderate. The Timberline View and Pioneer Village Subdivisions are also within the corridor.

Impacts to other uses in the area, such as ranching and grazing and several salvage yards, are assessed as low. Short-term disturbances would occur during construction, however, long-term impacts would be minor and not differ from the existing 69 kV line.

Planned Land Uses - Conformity with Adopted Plans and Policies. This alternative alignment crosses public BLM lands for 4.2 miles, and private lands administered by Montrose and San Miguel Counties for 11.5 and 3.8 miles, respectively. The proposed Project would consist of building the 115 kV transmission line across BLM lands that are designated as Emphasis Area A (Livestock Management). Impacts of the project construction and operation are considered to represent low to no identifiable conflicts with the BLM's RMP. Management guidance allows major utility lines within land designated for livestock management, but protective stipulations would be required to prevent or limit impacts to range management. No major new access roads would be needed for construction; however, existing access would be upgraded (widened and/or cleared) or spur roads to individual pole sites built. Upgraded access would be expected along 12.3 miles of the 115 kV corridor. Public BLM lands are crossed by the Nucla-Norwood Central Alternative for 4.2 miles. These lands have been classified as Category B1 and C (1-4, 2-4, 11-4 and 2-5) in the BLM's Fire Management Plan. Category B landscapes within the alternative corridor pertain to Naturita Canyon. Wildfires are not desired in Category B landscapes. The Category C landscapes pertain to areas where fire is desired, although social, political or ecological constraints must be considered. The Project could present a conflict with fire management objectives in these areas. Management conflicts are not considered significant, however.

The proposed alignment would extend along the northern border of State Trust lands located in the South ½ of Section 16, Township 45N 14W. This section of land is currently leased to a private entity for grazing purposes. No new roads would be constructed, but widening of existing access could be necessary and would require road access and right-of-way permits from the State of Colorado (DeVore 1999: pers. comm.). Given the use of the State Trust lands (*i.e.*, livestock grazing), and the location of the proposed transmission line along the boundary of the property, conflicts from construction and operation of the new 115 kV transmission line are considered low.

No impacts to adopted plans and policies are identified for Montrose County, since the county's general plan does not address this part of the county. With respect to San Miguel County, the Project would cross 2.5 miles of lands that are identified as Priority Class 2 (CDP 1998). These include irrigated agricultural lands and pastures, which are discussed above under existing land use. Potential conflicts with the San Miguel County Comprehensive Development Plan Priority Class 2 are considered high.

With respect to other planned developments or projects, several agencies, the BLM and the State of Colorado plan to conduct controlled burns along the Montrose/San Miguel County line south of Redvale ***(Figure LAND-6)*** over the next several years (between 1999 and 2010). Construction of the new corridor through a planned burn area could result in management conflicts, assessed as moderate in degree, due to the uncertainty regarding the timing of controlled burns and the proposed project implementation. No other impacts with planned land uses or developments have been identified for this alternative.

Substation Effects

Effects of substation modifications would be the same as described previously for the Nucla-Norwood Northern Alternative.

69 kV Transmission Line and Distribution System Effects

Changes to SMPA's distribution system would be similar to those described previously for the Nucla-Norwood Northern Alternative. Less than 0.5 mile of the 115 kV line would be underbuilt with distribution service in the vicinity of Norwood. Approximately 1.0 mile of the 69 kV line would also be retained and used as distribution service. This would occur west of and through portions of the community of Redvale.

This alternative would result in the removal of approximately 10.7 miles of the 69 kV line through parts of Redvale and surrounding rural agricultural lands. Long-term, the removal of the line would be a beneficial effect to local residents and farmers, currently affected by poles and easement restrictions. Short-term impacts to existing land uses may result from the presence of equipment and crews dismantling the line. These effects are considered low short-term effects.

SMPA has suggested that approximately 1.8 miles of the 69 kV line, located between the Nucla Substation and SR 145, may be retained as distribution and the existing distribution line removed instead. This change would not substantially alter the land use impacts to public BLM and private lands reported here.

Nucla-Norwood Southern Alternative

This alternative would cross public lands for 8.5 miles and private lands for 9.7 miles, including 7.4 miles in Montrose County and 10.8 miles in San Miguel County. The 115 kV line would be constructed parallel to the existing Nucla-Cahone 115 kV line from Nucla to the Montrose/San Miguel County border. This alternative then turns southeast, follows existing seismic line disturbances, and crosses Naturita Canyon before it terminates at the Norwood Substation ***(Plate PROJECT-5)***. Access to the alternative would be provided by both existing roads and easements, and seismic line disturbances that would be widened and developed as new access. Substation modifications would include minor improvements to the Nucla Substation and expanding the existing Norwood Substation (Site A). Approximately 15 miles of the alternative would be constructed with improved access.

115 kV Transmission Line Effects

Existing Land Uses. This alternative would cross 0.3 mile of irrigated agricultural land in San Miguel County. Impacts to agriculture are considered high. No impacts to prime farmlands would occur. This alternative alignment would not directly impact any residences, although the alignment is within 300 feet of five residences, and within 0.5 mile of 40 residences that would be affected indirectly by the construction noise, dust, traffic and visual effects. The Southern Alternative corridor also crosses portions of the La Mesa Subdivision.

Planned Land Uses -Conformity with Adopted Plans and Policies. This alternative alignment crosses public BLM lands and lands administered by Montrose and San Miguel Counties. The proposed Project would consist of building the 115 kV transmission line across BLM lands that are designated as Emphasis Areas A (Livestock Management) and J (Forestry). Impacts of the project construction and operation are considered to represent low to no identifiable conflicts with the BLM's RMP and management objectives for Emphasis Area A lands. Management guidance allows major utility lines within land designated for livestock management, but

protective stipulations would be required to prevent or limit impacts to range management. For Emphasis Area F lands, the RMP management guidance allows construction of major utilities across woodland areas. Helicopter construction methods would be utilized in this area and, therefore, impacts would be minimized since no new access roads are proposed (low impact). Public BLM lands are crossed by the Nucla-Norwood Southern Alternative for 8.5 miles. The majority of these public lands are classified in the BLM's Fire Management Plan as Categories B1, and C (11-4, 1-4, 2-4 and 2-5). The Project is considered compatible with Fire Management Category B areas; while some constraints to management objective may occur in Category C areas. Management conflicts are not considered significant.

This alternative would be constructed adjacent to an existing powerline easement for 5.9 miles and establish a new utility corridor for 12.4 miles. Existing seismic line disturbances would be widened to provide access for construction equipment and crews and would be maintained for the operation and maintenance of the Project.

No impacts to adopted plans and policies are identified for Montrose County, since the County's general plan does not address this part of the county. With respect to San Miguel County, the Project would cross lands that are identified as Priority Class 2 (CDP 1998). These include irrigated agricultural lands and pastures, which are discussed above under existing land use. Potential conflicts with the San Miguel County Comprehensive Development Plan priority classes are considered high for Priority Class 2.

With respect to other planned developments or projects, several agencies, the BLM and the State of Colorado plan to conduct controlled burns along the Montrose/San Miguel County line south of Redvale (***Plate CUMULATIVE-1***) over the next several years (between 1999 and 2010). Construction of the new corridor through a planned burn area would result in management conflicts, assessed as moderate in degree, due to the uncertainty regarding the timing of controlled burns. No other impacts with planned land uses or developments have been identified for this alternative.

Substation Effects

Effects of substation modifications would be the same as described previously for the Nucla-Norwood Central Alternative.

69 kV Transmission Line and Distribution System Effects

Changes to SMPA's distribution system would be similar to those described previously for the Nucla-Norwood Central Alternative. Less than 0.5 mile of the 115 kV line would be underbuilt with distribution service in the vicinity of Norwood. Another 0.5 mile of 69 kV line would be retained as distribution west of and through a part of the community of Redvale. This alternative would also result in the removal of approximately 15.3 miles of the 69 kV line through other parts of Redvale and surrounding rural agricultural lands. Short-term impacts to existing land uses may result from the presence of equipment and crews dismantling the line. These effects are considered low. Long-term effects from removing the 69 kV line and associated easement restrictions would be beneficial.

SMPA has suggested that approximately 1.8 miles of the 69 kV line, located between the Nucla Substation and SR 145, may be retained as distribution and the existing distribution line removed instead. This change would not substantially alter the land use impacts to public BLM and private lands reported here.

Norwood-Sunshine Alternative

The Norwood-Sunshine Alternative would entail the rebuilding of the existing 69 kV transmission line to a single-circuit 115 kV transmission line from the Norwood Substation to the Sunshine Substation. Three design variations to the proposed single circuit 115 kV line would be necessary, including: 1) a new single circuit 115 kV line with distribution underbuilt would extend approximately 0.5 mile southeast from the Norwood Substation; 2) nearly 2.0 miles of new three phase overhead distribution line would be constructed in the vicinity of the Oak Hill Substation; and 3) in the vicinity of Specie Mesa, distribution would be underbuilt along approximately 3.0 miles of the new 115 kV line. In addition, an existing single circuit 115 kV line near the Sunshine Substation would be rebuilt as a double circuit 115 kV line, and an overhead distribution line, which terminates at the substation, would be placed underground.

The new 115 kV line would be constructed within an existing utility corridor that traverses public land for 2.8 miles and privately owned lands for 25.5 miles. Access during construction of the new transmission line would be provided primarily by existing roads or using overland methods. Some spur roads may be constructed on private lands, depending on landowner negotiations. An estimated 2.8 miles of the alignment are proposed for access improvements. In addition, helicopter construction would be utilized across about 4.2 miles of sensitive areas, including Beaver Creek Canyon and steep slopes in the vicinity of Fall Creek and Sunshine Mesa (see ***Plate PROJECT-6***).

Substation modifications include enlarging the Sunshine Substation and dismantling the existing Oak Hill Substation. Minor enlargements would also be necessary at the Wilson Mesa and Specie Substation taps.

115 kV Transmission Line Effects

Table 3.8-6 summarizes the land use impacts for the Norwood-Sunshine and Norwood-Telluride Alternatives.

Existing Land Uses. The Norwood-Sunshine Alternative primarily crosses undeveloped lands of San Miguel County. Irrigated agricultural lands would continue to be crossed for 1.0 mile, south of Norwood in the vicinity of the Oak Hill Substation. Impacts to irrigated agricultural lands are assessed as high. Less than 0.1 mile of prime farmland would be crossed and could be spanned. This alternative would also have potentially high impacts on the Fitts (Hillside) Subdivision, located directly to the southeast of the Norwood Substation (Link 9). Increased easement widths and restrictions would potentially directly impact several homes, and/or impose substantial limitations on land use options for those lots that are within the rights-of-way.

Across Beaver Mesa, Specie Mesa, Wilson Mesa, and Sunshine Mesa, the Norwood-Sunshine Alternative would increase the ongoing effects of the 69 kV line. Private lands affected range from large landholdings on Beaver Mesa, to smaller lots on Wilson Mesa. In all instances the proposed Project would increase the easement from approximately 50 feet to 75 feet or 100 feet, and further restrict the types of land uses and structures that may be within the right-of-way. Impacts to private lands would range from low to high, depending upon specific lot sizes and where the line and easement crosses. On average, impacts to existing and future uses on private parcels would be expected to be moderate in degree, since this alternative would be a widening of a pre-existing transmission line easement. Specific approved subdivisions that would be physically crossed by this alternative include: Beaver Pines, Specie Mesa Ranch, Top of the World, Wilson Mesa Ranch and Ptarmigan Ranch. Other nearby developments, within two miles, that may be affected visually by the Project include: Mountain View and Oak Hill

Subdivisions, Estate Ranches, Specie Wilderness Subdivision, Specie Ridge, Little Cone Ranch and Elk Creek Ranch.

Table 3.8-6
Summary of Land Use Impacts - Norwood-Sunshine/Telluride Alternatives

Land Use Issues/Impacts	Norwood-Sunshine Alternative	Norwood-Telluride Alternative
Existing Land Uses		
Miles of Irrigated Agriculture Crossed	1.0 mile - high impact	1.0 mile - high impact
Miles of Prime Farmlands Crossed	0.1 mile - high impact	0.1 mile - high impact
Number of Residences Crossed by the Alignment	2 structures - high impact	2 structures - high impact
Total Number of Homes within 300 feet of Alignment	10 residences - moderate impact	9 residences - moderate impact
Total Number of Homes within the corridor	92 residences - moderate to low impacts	81 residences - moderate to low impacts
Conflicts with Approved Developments – number of developments crossed	6 - moderate to high impacts - Fitts Subdivision, Beaver Pines, Specie Mesa Ranch, Top of the World, Wilson Mesa Ranch and Ptarmigan Ranch.	• 4 - moderate to high impacts - Fitts Subdivision, Beaver Pines, Specie Mesa Ranch, Top of the World. • Potential conflicts with 3 residences planned by CDOT near Deep Creek (Lime)
Planned Land Uses		
USFS Management Areas Crossed --		
2B - Rural Recreation and Roaded Natural	Moderate Impact - Located in established utility corridor – no change in number of facilities.	Moderate Impact - Located in established utility corridor – no change in number of facilities.
BLM Emphasis Areas Crossed --		
Emphasis L1 - San Miguel River ACEC	Moderate Impact - Located in established BLM utility corridor – no change in number of facilities. Right-of-way widened, however.	Moderate Impact - Located in established BLM utility corridor – No change in number of facilities. Right-of-way widened, however.
Emphasis C1 - San Miguel River Canyon SRMA	Moderate Impact - Located in established BLM utility corridor – no change in number of facilities. Right-of-way widened, however.	High Impact - Visibility from major transportation route. See Visual Resources, Section 3.10.
State of Colorado Trust Lands	Moderate Impact - Located in established utility corridor – no change in number of facilities. Right-of-way widened, however.	Moderate Impact - Existing 69 kV line would be retained for distribution. No widening of right-of-way required, however distribution would be undergrounded at eastern edge of section.
San Miguel County – Priority Class Lands Affected –		
Priority Class 2 - Irrigated Farmland, Meadows, and Pastures	11. 3 miles - high impact	7.4 miles - high impact
Priority Class 3 - Visibility from major transportation routes (SH 145)	No identifiable effect.	High impact – see visual resources section 3.10
Priority Class 3 - Impacts to natural streams and ponds	21 crossings - high impact - see water resources section 3.5	19 crossings - high impact - see water resources section 3.5
Priority Class 3 - Lands having significant cultural resources	Unknown at this time - high sensitivity areas include 6 canyon crossings; see cultural resources section 3.7	Unknown at this time - high sensitivity areas include 5 canyon crossings; see cultural resources section 3.7
Priority Class 3 - Geologic hazard areas	4.2 miles -- high impact – see geology section 3.3	14.9 miles -- high impact – see geology section 3.3
Priority Class 3 - Critical wildlife areas	Potentially moderate impacts to Mexican spotted owl habitat, southwestern willow flycatcher habitat, boreal toad breeding habitat. See biology section 3.6.	Potentially moderate impacts to Mexican spotted owl habitat, southwestern willow flycatcher habitat, boreal toad breeding habitat. See biology section 3.6.

This alternative would have potentially direct physical impacts on two existing residences (High Impact). Indirect impacts resulting from construction-related noise, dust and traffic may result to residents within 300 feet of the alignment (10 residences, moderate impact) and recreationists within 0.5 mile of the alignment. Approximately 92 homes are within 0.5 mile of the alternative alignment where moderate to low impacts could result during construction.

Planned Land Uses – Conformity with Adopted Plans and Policies. *Forest Service.* At the eastern end of the Project the 115 kV transmission line would cross 1.1 mile of the Uncompahgre National Forest that is managed by the Forest Service for rural recreation and roaded natural (*i.e.*, Management Area 2B). While the Management Prescription for Area 2B does not specifically address utility corridors, Management Prescription 1D states that transmission corridors are to be constructed to harmonize with the landscape and blend with the environment. Across National Forest system lands, the existing 69 kV transmission line would be rebuilt as a single circuit 115 kV line for approximately 0.6 mile, until it joins with the existing Hesperus-Cascade 115 kV line in the Ilium Valley. From this point, the proposed 115 kV line would be constructed on double circuit steel poles, along with the existing 115 kV system, to the Sunshine Substation (approximately 0.6 mile). Existing distribution lines in this area would be undergrounded in the road shoulder of the South Fork Road. Since the new 115 kV line would remain within the established utility corridor, and the proposed line would be built in the same location as the existing lines, the Project would be consistent with the management prescription for Area 2B and would not increase impacts over the existing conditions. In this regard, the Project is also considered consistent with the Forest Service's utility guidelines (Prescription 1D) (moderate impact). Conformity with the Forest Service's visual quality objectives are discussed further in Section 3.10, Visual Resources.

BLM. The Norwood-Sunshine Alternative crosses approximately 1.0 mile of Management Area L1 (San Miguel River – ACEC), as well as 0.01 mile of Management Area C1 (San Miguel River Canyon Special Recreation Management Area – SRMA). Construction of the line is consistent with BLM's Management Direction for L1, since the Project would consist of replacing/rebuilding the existing 69 kV line to 115 kV within the existing utility corridor. Helicopter construction would be utilized within the ACEC, and the pole structures would span sensitive resources and canyons. The Project is also considered to be consistent with the BLM's RMP for C1 areas for the same reasons noted above for the ACEC (L1). Moderate impacts are identified for these issues. Public BLM lands are crossed by the Norwood-Sunshine Alternative for 1.1 miles. These public lands include Beaver Canyon and Saltado Creek Canyon that are classified as Category B in the BLM's Fire Management Plan. Wildfires are not desired in Category B Fire Management Areas. This category is used for areas of urban interface, including electrical substations. The Project is considered compatible with lands classified as Category B.

State of Colorado. An existing 69 kV transmission line extends across approximately 0.6 mile of State Trust lands located northeast of the Wilson Mesa Substation (***Plate PROJECT-6***). The State land encompasses Section 36, Township 43N 11W and is currently leased to a private entity for agricultural use. The State Land Board designated this section of land into its Stewardship Trust to retain its environmental values. Lands within the Stewardship Trust are managed to maximize options for continued stewardship, use by the public, or further disposition by protecting and enhancing the beauty, natural values, open space and/or wildlife habitat.

The 69 kV line would be upgraded to a 115 kV single circuit transmission line within the existing alignment. Replacement of the 69 kV line would be conducted by helicopter and overland construction methods, and no new roads would be developed through the State Trust property. However, it may be necessary to expand the existing utility corridor up to 50 feet in width for construction of the 115 kV transmission line. Expansion of the existing utility

corridor would conflict with the State's Stewardship Trust program to manage this land and protect it from further development, including the construction of utilities. The impact to the State Trust land is considered moderate since a utility corridor already exists.

San Miguel County. The majority of this alternative crosses private lands of San Miguel County (25.5 miles). Tri-State would be required to obtain a Special Use Permit from San Miguel County prior to construction. With respect to conformity with the San Miguel County Comprehensive Development Plan, this alternative would cross lands that are considered Priority Classes 2 and 3. These include crossing an estimated 11.3 miles of irrigated agricultural lands, pastures and meadows (Class 2), which are discussed above under existing land use; natural streams and ponds (Class 3), discussed in Section 3.5, Water Resources; and critical wildlife habitat described in Section 3.6. Potential conflicts with the San Miguel County Comprehensive Development Plan are considered high for Priority Classes 2 and 3.

Substation Effects

The Norwood-Sunshine Alternative would entail making minor modifications to the Specie Mesa, Wilson Mesa and Sunshine Substations and dismantling the existing Oak Hill Substation. The Specie Mesa and Wilson Mesa Substations would be increased in size by approximately 10 feet by 10 feet to allow for the installation of new transformer equipment. These two substation taps are located on private lands of San Miguel County and would require a Special Use Permit from the County prior to construction. Lands surrounding these sites are currently undeveloped, and no specific conflicts with existing or planned land uses have been identified. The Sunshine Substation is located in the Uncompahgre National Forest and would require moving the fenceline approximately 10 to 20 feet on the south edge of the existing fence boundary. Expansion of the site would be within an area currently dedicated to the Sunshine Substation Facility and no conflicts with existing land uses or planned land uses are noted.

Removal of the existing Oak Hill Substation would have no identifiable adverse impact to existing or planned land uses. The Oak Hill Substation is currently located in an area of San Miguel County used for ranching and farming. The removal of this facility would have a beneficial effect to surrounding land uses since any ongoing land use restrictions in the vicinity of the substation would be removed. However, in order to remove the substation, the distribution system would be extended along approximately one mile of agricultural field boundaries.

69 kV Transmission Line and Distribution System Effects

This alternative would entail rebuilding the 69 kV line between the Norwood and Sunshine Substations as a 115 kV facility. As such, no additional impacts, beyond those reported for the 115 kV line above, would be anticipated from removing/rebuilding the 69 kV line.

Changes to SMPA's distribution system associated with this alternative include underbuilding the 115 kV line with distribution service through the Fitts (Hillside) Subdivision; constructing approximately 4 miles of new three-phase distribution line between the Norwood and Oak Hill Substations; underbuilding the 115 kV line with distribution service for approximately 3.0 miles east of the Specie Mesa Substation; and undergrounding existing distribution service for approximately 0.5 mile north of the Sunshine Substation in the Uncompahgre National Forest. Impacts associated with distribution changes between the Norwood and Oak Hill Substations are assessed as moderate, since the lines would be constructed along a county road and through irrigated agricultural lands. Distribution underbuilt on the 115 kV system, east of Specie Mesa, may have potentially high conflicts with San Miguel County's guidelines for utilities. Visual impacts of this distribution change are discussed in more detail in Section 3.10, Visual Resources. Distribution lines undergrounded in the road shoulder of South Fork

Road, through National Forest Management Area 2B lands, would not impact any identified existing or planned land uses.

Norwood-Telluride Alternative

The Norwood-Telluride Alternative extends approximately 29 miles and would cross over 22 miles of private land in San Miguel County and about seven miles of public lands. This alternative consists of rebuilding the existing 69 kV line to 115 kV from the Norwood Substation to the eastern edge of Specie Mesa. A new 115 kV transmission line would be constructed from the eastern edge of Specie Mesa to a point just east of South Fork Road in Ilium Valley. This portion of the route primarily crosses public BLM lands along the edge of the San Miguel River Canyon. No new access roads are proposed; existing roads would be utilized where available and construction would be accomplished by helicopter in remote areas. Associated actions with this alternative include making minor modifications to the Specie Mesa and Telluride Substations, removing the Oak Hill and Wilson Mesa Substations, underbuilding the existing distribution on the 115kV line for approximately two miles from Deep Creek (Lime) to South Fork Road, and extending distribution service underground and overhead in the Wilson Mesa Area (see ***Plate PROJECT-7***). Distribution lines would also be undergrounded for approximately 1.0 mile east of the Telluride Substation, both in the Galloping Goose Trail and in the existing utility easement.

115 kV Transmission Line Effects

Existing Land Uses. The Norwood-Telluride Alternative primarily crosses undeveloped lands of San Miguel County and public lands administered by the BLM and Forest Service.

Irrigated agricultural lands would continue to be crossed for 1.0 mile, south of Norwood in the vicinity of the Oak Hill Substation. Impacts to irrigated agricultural lands are assessed as high. Less than 0.1 mile of prime farmland would be crossed and could be spanned. This alternative would also have potentially high impacts on the Fitts (Hillside) Subdivision, located directly to the southeast of the Norwood Substation (Link 9). Increased easement widths and restrictions would potentially directly impact several homes, and/or impose substantial limitations on land use options for those lots that are within the rights-of-way.

Across Beaver Mesa and Specie Mesa, the Norwood-Telluride Alternative would increase the ongoing effects of the 69 kV line. Private lands affected range from large landholdings on Beaver Mesa to comparatively smaller lots on Specie Mesa. In all instances the proposed Project would increase the easement from approximately 50 feet to 75 or 100 feet, and further restrict the types of land uses and structures that may be within the right-of-way. Impacts to private lands may range from low to high, depending upon specific lot sizes and where the line and easement crosses. On average, impacts to existing and future uses on private parcels would be expected to be moderate in degree, since this alternative would be a widening of a pre-existing transmission line easement across Beaver and Specie Mesas. Specific approved subdivisions that would be physically crossed by this alternative include: Beaver Pines, Specie Mesa Ranch, and Top of the World. Other nearby developments, within two miles, that may be affected visually by the Project include: Mountain View and Oak Hill Subdivisions, Estate Ranches, Specie Wilderness Subdivision and Specie Ridge.

On the eastern edge of Specie Mesa, in the vicinity of Fall Creek, the alternative alignment routes to the north and northeast, staying mainly on public BLM lands along the upper benches of the San Miguel River Canyon, until it descends behind the CDOT maintenance facility at Deep Creek (also known as Lime). Eastward from this point, the alignment crosses

public and private open space until it reaches the Ilium Valley. Along this stretch, potential land use impacts in the Ilium Valley could result from increases in easement width and restrictions, particularly where the line would route through the Ilium Valley Business and Industrial Park. Construction of the corridor through platted parcels may interfere with established developmental plans for commercial and industrial facilities. Impacts to platted parcels in this area could range from low to high. Other short-term construction-related traffic impacts may result to other developments in Ilium Valley including the Ilium Valley sand and gravel operation, the County's Detention Center and the County's Refuse Transfer Station. Short-term traffic-related effects to these uses in Ilium Valley are discussed in Section 3.12.

This alternative would have potentially direct physical impact on two existing residences. There may be indirect impacts resulting from construction-related noise, dust and traffic to residents and recreationists within 0.5 mile of the alignment. In total, approximately 9 homes are within 300 feet (moderate impact) and 81 homes are within 0.5 mile of the alternative alignment (moderate to low impact).

Planned Land Uses – Conformity with Adopted Plans and Policies. *Forest Service.* The new 115 kV single circuit transmission line would cross 0.7 mile of the Uncompahgre National Forest that has been classified as Management Area 2B, which is managed for roaded natural and rural recreation opportunities. The Management Prescription for Area 2B does not specify compatibility or non-compatibility of utility corridors/facilities, but the Forest Service's Management Prescription 1D states that transmission corridors blend with the local environment and are designed and constructed to harmonize with the landscape. The existing 115 kV pole structures, which presently carry the distribution line as an underbuilt west of South Fork Road, would be reconstructed as a double circuit 115 kV line and the distribution line would be undergrounded. Consequently, no major changes to the existing utility corridor in this part of the Uncompahgre National Forest would occur. Moderate impacts are identified for this issue due to ongoing incompatibility in management objectives.

BLM. The Norwood-Telluride Alternative would cross 6.3 miles of public BLM lands that have been classified as Emphasis Areas C1 and L1. The San Miguel River ACEC (L1) would be crossed within the existing utility corridor (moderate impact). The existing 69 kV transmission line extends across approximately 1.0 mile of the San Miguel River ACEC. This line would be rebuilt to a single-circuit 115 kV line within the existing utility corridor, which is consistent with the BLM's Management Direction. No new access would be developed through the ACEC and construction methods would include spanning the riparian area. Public BLM lands are crossed by the Norwood-Telluride Alternative for 6.3 miles. These public lands include Beaver Canyon, Saltado Creek Canyon and the San Miguel River Canyon that are classified as Category B in the BLM's Fire Management Plan. Wildfires are not desired in Category B Fire Management Areas. This category is used for areas of urban interface, including electrical substations. The Project is considered compatible with lands classified as Category B.

Approximately 5.3 miles of the San Miguel River SRMA (C1) would be directly affected. Helicopter construction methods for the new 115 kV single circuit transmission line would be used in most areas. Impacts to the SRMA are assessed as high, however utilities are a permitted use. Noise would be associated with the use of helicopters, but the effects would be short-term in nature (see Section 3.13). Although the BLM's Management Direction allows major utility corridors through the SMRA (subject to the BLM's VRM guidelines), long-term effects to recreational resources and visual quality would result (see Sections 3.9 and 3.10). Public BLM lands are crossed by the Norwood-Telluride Alternative for 6.3 miles. These public lands include Beaver Canyon, Saltado Creek Canyon and the San Miguel River Canyon that are classified as Category B in the BLM's Fire Management Plan. Wildfires are not desired in Category B Fire Management Areas. This category is used for areas of urban interface,

including electrical substations. The Project is considered compatible with lands classified as Category B.

San Miguel County. The Norwood-Telluride Alternative would cross private lands of San Miguel County for approximately 22.1 miles. Tri-State would be required to obtain a Special Use Permit from San Miguel County prior to construction. With respect to conformity with the San Miguel County Comprehensive Development Plan, this alternative would cross lands that are considered Priority Classes 2 and 3. These include an estimated 7.4 miles of Class 2 irrigated agricultural land, pastures and meadows. Class 3 lands potentially affected include lands containing or having significant impact on natural resources, natural streams and ponds, skylines visible from major transportation routes (SH 145, San Juan Skyway Scenic Byway), and geologic hazard areas (Class 3). Potential conflicts with the San Miguel County Comprehensive Development Plan are considered high to moderate for Priority Classes 2 and 3. Reference should be made to Section 3.3 (Geology, Paleontology and Minerals), Section 3.5 (Water Resources), and Section 3.10 (Visual Resources) for additional information.

This alternative also affects lands that may be developed for the San Miguel River Hydroelectric Project. This Project is in the final permit and planning stages, and construction is expected to commence by 2002. The FERC facility lies within the 75- to 100-foot corridor west of the Telluride Substation. Potential conflicts with the 115 kV system are assessed as moderate to low in degree, since the proposed Project would be within an established utility corridor.

Finally, this alternative may affect lands planned by CDOT for 3 employee residences near Deep Creek (Lime). Potential land use conflicts are assessed as moderate to high due to topographic and river constraints.

Substation Effects

Expansion of the Telluride Substation, on the existing SMPA property, would have no direct impacts on existing or planned land uses. Modifications to the Telluride Substation would occur within the confines of the existing facility, with the exception of a new fence line along the northern border. The existing line would be removed and the new line would be constructed approximately 10 feet to the north (see Appendix A-1, *Figure A-2.2-4)*. As discussed in Section 2, this substation would be expanded to allow for the installation of additional switchyards and transformers.

This alternative also includes dismantling the existing Oak Hill and Wilson Mesa Substations, and would require minor modifications to the Specie Substation tap. Once the Oak Hill and Wilson Mesa Substations are dismantled, all equipment and hardware would be removed from the sites. Removal of these facilities would have beneficial visual effects on nearby rural residences.

69 kV Transmission Line and Distribution System Effects

Changes to SMPA's distribution system associated with this alternative are numerous and include, along the alternative alignment, underbuilding the 115 kV line with distribution service through the Fitts (Hillside) Subdivision; constructing 1.0 mile of new distribution north and west of the Oak Hill Substation; underbuilding the 115 kV line with distribution service for approximately 3.5 miles east of the Specie Mesa Substation; rebuilding an existing distribution line as underbuilt on the 115 kV system for approximately 2.0 miles east of the CDOT maintenance facility through Ilium Valley to the line's intersection with the existing Cascade-Hesperus Line; and undergrounding distribution from the Ilium Valley to the Telluride Substation, in order to make room for a double circuit 115 kV system. This alternative would also require several modifications on Wilson Mesa, in order for SMPA to

be able to dismantle the Wilson Mesa tap. These modifications include retaining the existing 69 kV line as distribution service from the eastern edge of Specie Mesa to Wilson Mesa, and undergrounding approximately 1.0 mile of distribution service, west of the existing Wilson Mesa tap. Finally, from the existing Wilson Mesa tap to the Sunshine Substation, 10.4 miles of the existing 69 kV line would be dismantled and removed (see ***Plate PROJECT-7***).

The effects of underbuilding the distribution service on the 115 kV system would be the same as described previously for the transmission line. These impacts are primarily visual in nature and are discussed further in Section 3.10. Impacts to irrigated agricultural lands, associated with approximately 4 miles of new three-phase distribution lines between the Norwood and Oak Hill Substations, are assessed as moderate, since the line would be constructed along a county road and through irrigated agricultural lands. Distribution underbuilt on the 115 kV system, east of Specie Mesa, may have potentially high conflicts with San Miguel County's guidelines for utilities. Impacts associated with undergrounding the distribution line from Ilium Valley to the Telluride Substation would primarily consist of short-term impacts to the Galloping Goose Trail (see Section 3.9, Recreation). The undergrounding of the distribution line may also represent a moderate conflict with the State of Colorado Trust Land, west of Wilson Mesa Substation (moderate impact), and the San Miguel River Hydroelectric Project (moderate impact). Depending on its location within the corridor, placement of the existing overhead distribution line underground could adversely affect development of the facility.

The planning boundary of the CPAC Transportation and Land Use Plan surrounds the eastern extent of the corridor (***Plate LAND-6***). The existing distribution line east of South Fork Road would be placed underground, through an area designated by CPAC as open space (CPAC 1998). However, construction would occur along the existing utility corridor; therefore, impacts are assessed as low.

3.8.2.3 IMPACTS OF THE SUBALTERNATIVES

There are five subalternatives, each of which is a minor system variation to the primary transmission alternatives (***Plate PROJECT- 8***). Subalternative A affects privately owned lands and lands administered by the BLM. Subalternatives B through E are located across privately owned lands in San Miguel County. No land administered by the Forest Service, State of Colorado or Montrose County would be affected by the subalternatives.

The impact of the subalternatives on existing and planned land uses are described below. Impacts common to all alternatives include the short-term dust, traffic and noise effects that would result from project construction. These issues are discussed in Sections 3.2, 3.12 and 3.13, respectively; and are not considered major due to the short-term effect on land uses (less than 5 years).

115 kV Transmission Line Routing Alternatives

Subalternative A - Alternative Crossing of Naturita Canyon Subalternative A would replace a portion of the Nucla-Norwood Southern Alternative and was suggested as a way to minimize visual impacts of crossing Naturita Canyon. This subalternative would be located on public BLM lands and would entail routing the 115 kV transmission line down into the canyon, rather than spanning it ridge to ridge. No new roads would be constructed. Tri-State would use existing roads (if present) or helicopter methods. BLM's management prescription for Naturita Creek is "*Bar* – Aquatic and Riparian Management." This management prescription consists of improving or enhancing aquatic/riparian habitat along the upper San Miguel River and its tributaries, and along 20 miles of the lower San Miguel River and its tributaries. In addition, management direction includes development of aquatic/riparian Habitat Management Plans (HMP) and intensive monitoring plans for areas along the San Miguel River and its tributaries.

The proposed Project may conflict with BLM's management objectives. Potential impacts are assessed as moderate in degree.

Subalternatives B, C and D - Routing Options South of Norwood Substation Subalternatives B, C, and D would all be located on private lands south of the Norwood Substation. These subalternatives could replace portions of either the Norwood-Sunshine or Norwood-Telluride Primary Alternatives. Subalternatives B, C, and D were identified as ways of avoiding, or minimizing some land use-related impacts associated with the primary alternatives, including direct effects to residences and agriculture.

Subalternative B would route the 115 kV line to the north of the Fitts (Hillside) Subdivision and entail converting the 69 kV line and poles to distribution service through the subdivision. This subalternative would be located on undeveloped, privately owned lands. This subalternative eliminates the potential physical conflicts of routing the 115 kV line through the subdivision. No direct physical impacts to residences would result. No other direct conflicts with existing or planned land use issues are identified.

Subalternative C would be another option to avoid the potential crossing of the Fitts (Hillside) Subdivision with the 115 kV transmission line. This subalternative would also route the 115 kV line on private lands of San Miguel County to the south of the subdivision. Similar to Subalternative B, Subalternative C would entail converting the 69 kV line and poles to distribution service through this area. By avoiding the subdivision, Subalternative C would also avoid potential direct conflicts with homes and other residential property. No direct physical impacts to residences would result. No other direct conflicts with existing or planned land uses are identified.

Subalternative D would locate the 115 kV transmission line along irrigated agricultural field boundaries. This subalternative is located west and north of the Oak Hill Substation and would avoid crossing the center of agricultural fields in a diagonal direction. The impacts of this subalternative on irrigated agricultural lands are considered moderate and less than the corresponding section of the primary alternatives, where high impacts were reported. This subalternative would still cross lands classified as Priority 2 by San Miguel County (irrigated agricultural lands and pastures).

Subalternative E - SH 145 and San Miguel River Area Lands affected by Subalternative E are in San Miguel County and privately owned. Subalternative E would replace a portion of the Norwood-Telluride Alternative east of Deep Creek (Lime), and was identified as a way of avoiding two crossings of SH 145 and the associated visual consequences. This subalternative would stay south of the San Miguel River, from the CDOT maintenance facility near Deep Creek to the vicinity of the intersection of SH 145 and South Fork Road. This subalternative would also entail relocating the existing distribution line from its current location and carrying it as an underbuilt to the 115 kV system. Subalternative E would be effective in reducing both the existing visual impacts of the distribution line and the future visual impacts associated with the Norwood-Telluride Alternative's crossing of SH 145 (see Visual Resources, Section 3.10). This subalternative would present other environmental conflicts, however, and thus represents a tradeoff of various environmental considerations. From a land use perspective, no developed land uses would be affected by Subalternative E. Recreation uses along the river and the future extension of the Galloping Goose Trail would be adversely affected and are discussed in Section 3.9 of the EIS.

Subalternative E would be constructed using helicopters and no new access roads would be built. Although these measures would be effective in minimizing physical ground disturbances, the line would be located near sensitive wetlands and wildlife areas. Consequently, this subalternative would affect lands classified as Priority Class 2 by San Miguel County.

UNDERGROUND SUBALTERNATIVE

The Underground Subalternative would cross portions of the Beaver, Specie, Wilson, and Sunshine mesa tops that are privately owned. The existing and planned land uses for the mesas are principally for residential development. During the construction of the underground transmission line, private lands would be physical disturbed along the five foot-wide trench. Long-term, the underground transmission line would impose some land use restrictions on private landowners with respect to the types of uses that could occur within the right-of-way and directly over the underground transmission cable. The degree of this impact would vary by land parcel, although in most instances impacts to land uses would be expected to be less than significant. The Underground Subalternative would also be compatible with San Miguel County's undergrounding policies regarding utility lines on these mesas. Overall, the Underground Subalternative would have beneficial effects by eliminating the existing overhead 69 kV line. Right-of-way land use restrictions would still apply, however.

NORWOOD SUBSTATION ALTERNATIVE SITE B

This alternative addresses the impacts associated with construction of the Norwood Substation at Site B, which is located about 1.0 mile southeast of the existing substation (***Plate PROJECT-8***). Site B is located on private land and no existing land use developments are present or planned for the property or immediate surrounding vicinity. Therefore, no impacts to existing or planned land uses are anticipated.

3.8.2.4 CUMULATIVE EFFECTS

Cumulative effects of the Project are addressed in this section from two perspectives: 1) the total physical effects of the various project components (*e.g.* 115 kV transmission line, substation changes, distribution system modifications, and access roads) on existing land uses, planned land uses and utility corridor policies of the Forest Service, BLM and Counties; and 2) cumulative effects of the Project when considering other reasonable and foreseeable future developments in the region (see ***Plate CUMULATIVE-1***).

Cumulative Project Effects and Utility Corridor Policies. *Table 2.2-1* (Chapter 2) shows the cumulative amount of land disturbance by county and land management agencies. From a land use perspective, the Nucla-Norwood Central and Southern Alternatives have the benefit of reducing impacts to sensitive residential and agricultural land uses that are currently ongoing from the 69 kV line and that would substantially increase if the 69 kV line were rebuilt in its existing location (*i.e.* the Nucla-Norwood Northern Alternative).

Between the Norwood Substation and the project termination point, the Norwood-Sunshine Alternative would result in less cumulative ground disturbance and would avoid impacts to the sensitive resources of the San Miguel River Canyon, that are protected by the BLM through the ACEC (L1) and SRMA (C1) management prescriptions. Both alternatives represent conflicts with the classification system for prioritizing lands for utilities in San Miguel County's Comprehensive Development Plan.

Cumulative Project Effects With Other Reasonable, Foreseeable, Future Activities and Projects. The proposed Project would essentially result in no net change in the number of high voltage powerlines crossing the project area over what exists today. The existing 69 kV line would either be upgraded in place (Nucla-Norwood Northern Alternative with the Norwood-Sunshine Alternative), or relocated. From this perspective, the Project would have minimal cumulative effects with other planned developments. The size and scale of the line would be increased, as well as the width of the easement, thereby impacting existing land uses and planned land uses, due to easement restrictions on the types of structures and activities that may occur within the right-of-way.

Reasonable, foreseeable future projects that may have cumulative interactive effects with the Project within the immediate project area include federal planned controlled burns and timber sales; future development of approved subdivisions around Norwood and on Specie, Wilson and Sunshine Mesas; CDOT's planned employee housing at Deep Creek (Lime); future development of the Ilium Valley Business and Industrial Park and the San Miguel River FERC Hydroelectric Project; improvements along SH 145 and South Fork Road; and SMPA's potential expansion of either the Specie or Wilson Mesa Substation. SMPA's expansion of either the Wilson and/or Specie Substations from 0.001 to 1.0 acre could create substantial cumulative short-term and long-term land use impacts to private lands on Wilson and Specie Mesas. Short-term effects would result if construction of the substation(s) and transmission line occur during the same time periods, resulting in increased noise, dust, and traffic impacts. Due to the short-term nature of these construction impacts, these cumulative effects would not be significant. Long-term significant cumulative effects to scenic quality and property values could result from the landscape quality changes of the transmission line and expanded substations, however. Cumulative effects on Specie Mesa would apply to both the Norwood-Sunshine and Norwood-Telluride Alternatives. Cumulative effects on Wilson Mesa pertain to the Norwood-Sunshine Alternative only. Cumulative visual and property value effects are discussed further in Sections 3.10.2.4 and 3.11.2.5 of the EIS. Except for timber sales and prescribed burns on public lands, these cumulative project effects would result in increased conversion of natural habitats and open space to other uses in response to growth in the region.

On a regional level, the Project would provide for substantially greater system reliability. From this perspective the Project would eliminate an obstacle to growth in the Telluride Region and, specifically, to lands planned for future residential, recreation and commercial development as part of the Telluride Land Use and Transportation Plan.

3.8.2.5 POTENTIAL MITIGATION MEASURES AND RESIDUAL EFFECTS

The following potential measures should be considered:

- In order to reduce potential impacts to agriculture, during final design and landowner negotiations, Tri-State should route the 115 kV right-of-way line in such a way as to avoid agricultural fields, where feasible; or to route the line along agricultural field boundaries, rather than across, or diagonally through, the center of fields;
- In order to avoid potential direct impacts to residences during final design and landowner negotiations, Tri-State should route the 115 kV transmission line in a manner that avoids direct conflicts with residences and other structures that would need to be removed from the right-of-way due to electrical easement requirements;
- In order to reduce potential conflicts with San Miguel County's Ilium Valley Business and Industrial Park, Tri-State should coordinate with the County to identify specific locations through platted parcels that would reduce potential conflicts to the degree possible (Norwood-Telluride Alternative).
- In order to reduce potential conflicts with San Miguel County's Priority Class 1, 2, and 3 lands, SMPA should underground the distribution changes that would be required, particularly through the Fitts (Hillside) Subdivision and on Specie Mesa;
- In order to reduce potential conflicts with San Miguel County's Priority Class 1, 2 and 3 lands, Tri-State should provide final design and access plans to the county for review and approval that demonstrate how potential conflicts with these classes have been minimized to the extent feasible.

With implementation of the above measures, most impacts could be reduced to moderate levels, particularly along the Nucla-Norwood Central Alternative, and the Norwood-Sunshine

Alternative. Impacts to the UNF and public BLM lands could be reduced to moderate or low levels through careful pole placements and access roads and use of helicopter construction in sensitive areas.

However, short-term indirect impacts caused by noise, dust and visual effects from construction activities, and the long-term presence of the proposed transmission line facilities are unavoidable and would affect the setting and quality of existing residential and recreational land uses. Conflicts with San Miguel County's Priority Class 2 and 3 lands would also remain, including conflicts with views from major transportation routes, residential and recreation areas and agricultural lands.

Some high residual impacts to San Miguel County's Priority Class 2 and 3 landscapes and to recreational uses would remain along all the alternatives. Within San Miguel County, residual effects would be similar for all the Nucla-Norwood Alternatives, and greatest for the Norwood-Telluride Alternative.

3.8.2.6 IMPACTS OF THE GENERATION ALTERNATIVES

Development of a Distributed Generator Alternative would result in ground disturbances at the generator site (approximately 1 to 3 acres). In addition, ground disturbances would occur from the extension of the gas pipeline. The general locales where potentially feasible generator sites have been identified vary significantly in land use setting. Sites near the Telluride Substation are situated near areas previously developed for commercial and industrial uses. Sites further south in the Ilium Valley are either near industrial and residential developments or in predominately undeveloped areas of the national forest. Consequently, land use compatibility issues vary substantially among these sites. Detailed siting, design and engineering information would be necessary to determine the actual land use impacts of a Generator Alternative, if proposed in the future. The potential compatibility of a Generator Alternative with existing and planned land uses, and federal, state and local land use plans and policies would also need to be examined further. In addition to the generator site, the Generator Alternatives would also result in land use changes near Redvale where the natural gas compressor station would be installed. It is anticipated that a suitable site, compatible with surrounding agricultural uses, is feasible.

In addition to the land use impacts from the generator sites, these alternatives would cause varying degrees of impacts from transmission, substation and distribution system modifications. The Small Generator and Emergency Generator Alternatives would entail rebuilding the 44/69 kV Nucla-Sunshine line to 69 kV. As discussed in Chapter 2.0 and shown in *Figure 2.3-1*, the land use impacts would be the very similar to the proposed 115 kV. (See impact discussions for the Nucla-Norwood Northern Alternative and Norwood-Sunshine Alternative). With the Large Generator Scenario, beneficial impacts to residential and open space land uses could result between the Norwood Substation and the Sunshine Substation if the existing 44/69 kV line is removed and distribution service placed underground. In this situation, the existing visual effects of the 44/69 kV line would be removed. Should this line be converted to an overhead distribution line instead, impacts to existing and future land use options would remain the same as they exist today.

Another major land use-related issue associated with this type of alternative is whether the emissions from a generator facility would potentially affect the visibility conditions at nearby Class I or Class II wilderness areas. Class I and II wilderness areas within 100 km of Telluride Substation include: West Elk (Class I, 82 km), La Garita (Class I, 53 km), Weminuche (Class I, 24 km), Big Blue (Class II, 22 km), Lizard Head (Class II, 15 km), Mt. Sneffels (Class II, 5 km) and Black Canyon/Gunnison (Class I, 70 km).

As part of the EIS analysis for the Generator Alternatives, modeling studies were conducted for the three Generator Alternatives to determine whether impaired visibility could result. The studies were conducted in accordance with EPA's approved VISCREEN model, and documented whether the generator emissions from a 24-hour period could impair visibility based upon two parameters - plume perceptibility and plume contrast. These studies and the emission assumptions for each of the Generator Alternatives are discussed in more detail in Section 3. 2, Climate and Air Quality. The study findings indicated that the Generation Alternatives could affect the visibility conditions at the following wilderness areas:

- Large Generator Alternative - Class I - La Garita, Weminuche; Class II - Mt. Sneffels, Lizard Head, Big Blue
- Small Generator Alternative -Class I - no wilderness areas affected; Class II - Mt. Sneffels, Lizard Head, and Big Blue
- Emergency Generator Alternative - Class I - No wilderness areas affected; Class II - Mt. Sneffels, Lizard Head and Big Blue

In summary, the studies concluded that based upon the generator alternative assumptions used for this EIS analysis, there is a potential for visibility impacts at the wilderness areas noted above. Visibility impacts to wilderness areas would cause significant adverse effects to the natural qualities of these federally protected areas. Additional studies would be required if a specific generator alternative were proposed by an energy developer on public lands in the future.

3.8.2.7 NO ACTION ALTERNATIVE

The No Action Alternative would mean that the existing 69 kV transmission line would remain in operation. Ongoing conflicts with agricultural lands and operations would remain, and potentially increase over time, as more maintenance is required. Increased maintenance and access into these agricultural areas would further disrupt farming practices and irrigation, as well as potentially cause increased soil compaction and related reductions in crop productivity. The No Action Alternative would also continue any ongoing conflicts with other private and public properties that exist today.

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3.9 RECREATION

ISSUES: The proposed Project may impact the quality of recreational experiences short-term, due to construction noises and activities; or long-term, due to the visual presence of the project facilities in areas valued for dispersed or developed recreational opportunities. Specific areas of concern include the San Miguel River Canyon ACEC and SRMA, Nature Conservancy Preserves, Naturita Canyon, and areas of the Uncompahgre National Forest that are used for dispersed and developed recreational activities. Through the NEPA process, recreational resources and uses should be identified and conflicting uses avoided to the extent possible.

3.9.1 AFFECTED ENVIRONMENT

Recreation is a significant contributor to the economic base of San Miguel and Montrose Counties. San Miguel County has experienced dramatic growth over the past several years, partly in response to the recreational opportunities provided by the Telluride Ski Area and other recreational activities available in the Uncompahgre National Forest, Uncompahgre Resource Area BLM lands, Mountain Village, Town of Telluride, and San Miguel and Montrose Counties.

The project area for recreation includes the project alternatives and the surrounding lands within three miles where the Project may affect the quality of recreational resources or user experiences. Encompassed within the project area are the Lizard Head and Mt. Sneffels Wilderness Areas, Telluride Ski Area, Galloping Goose Trail, San Miguel River corridor, Deep Creek, Bilk Creek and areas of the Uncompahgre National Forest (NF) and Bureau of Land Management (BLM) lands (see ***Plate REC-1***) that provide a wide array of both summer and winter recreational opportunities.

This section of the Environmental Impact Statement describes the recreation opportunity spectrum afforded by the project area public lands and the range of activities and uses that occur.

RECREATION OPPORTUNITY SPECTRUM

The Forest Plan classifies recreation opportunities on the National Forest according to Recreation Opportunity Spectrum (ROS) designations (USDA 1986). The designated ROS for national forest system lands must be consistent with management prescriptions set forth in the Forest Plan (USDA 1991). The BLM also utilizes this recreation classification system as a planning and management tool rather than for decisionmaking (Tucker 1999, pers. comm.). ROS categories have been identified by the BLM in planning activities for the Travel Management Plan (USDA 1998b). Lands crossed by the project alternatives are predominately located on private land that does not have ROS designations. BLM and Forest Service lands within the alternative corridors are characterized by the Rural (R), Roaded Natural (RN), Semi-Primitive Motorized (SPM), and Semi-Primitive Non-Motorized (SPNM) ROS classes for winter and summer. Surrounding areas have the same ROS designations with the addition of the Urban (U) designation and the Primitive (P) designation. The *U* designation encompasses the Ski Area boundary in which developed recreational activity is provided in both the summer and winter months. The *P* designation applies to the Mount Sneffels and Lizard Head Wilderness Areas. These ROS classes are defined in *Table 3.9-1* in declining order from most natural to most modified by human activity.

EXISTING RECREATIONAL RESOURCES AND ACTIVITIES

Numerous private and public recreational resources and activities are available in Montrose and San Miguel Counties during all seasons. Recreation in the region is primarily outdoor-oriented with activities such as alpine and Nordic skiing, snowboarding, snowmobiling,

hunting, fishing, rafting, kayaking, hiking, horseback riding, mountain biking, camping, scenic driving, golfing and hang-gliding. In addition, the resort area of Telluride provides a multitude of special events and festivals, music concerts and plays.

Developed recreation facilities located in the project area include the Telluride Ski Area, facilities within the Town of Telluride and in the Mountain Village (including a golf course), the Telluride River Trail, the Galloping Goose Trail, Sunshine and Matterhorn Campgrounds, Alta Lakes, Sheep Corral Campground, Specie Creek Recreation Site, Beaver Creek Recreation Site, and Norwood Hill Recreation Site/Living Classroom Site, and many developed trails throughout the project area. ***Plate REC-1*** shows existing recreation resources within two to three miles of the project alternatives. In addition, Lone Cone, Little Cone, Wood's Lake, and Miramonte Reservoir are popular destinations for recreationists.

Table 3.9-1
Recreation Opportunity Spectrum (ROS) Designations

Abbr.	Designation	Description
(P)	Primitive	These areas are characterized by an unmodified natural environment, minimal evidence of other users, and essential freedom from human induced restrictions. Motorized use is not permitted. Users are provided with a very high likelihood of isolation from sights and sounds of human activity, reinforcing a sense of independence, closeness to nature, tranquility, and self-reliance. Outdoor skills are needed and the environment offers a high degree of challenge and risk.
(SPNM)	Semi-Primitive Non-Motorized	This area is characterized by an environment that appears predominately natural. Evidence of other users is present, but there is little interaction. Motorized use is not permitted. SPNM areas differ from primitive only by the degree in the type of recreational experience users enjoy. The probability of experiencing isolation, independence, closeness to nature, tranquility, and self-reliance in an environment of challenge and risk is high, although not as high as in a Primitive area.
(SPM)	Semi-Primitive Motorized	The character of these areas includes a predominately natural appearing environment within roaded areas with a moderate evidence of other users. Access by motor vehicles is permitted on roads and trails. The area is managed in such a way that minimum on-site controls and restrictions may be present, but are subtle. User expectations are similar to those for SPNM areas, but the probability of experiencing isolation and related "backwoods" senses is reduced by the increased accessibility for motor vehicles. Opportunity for interaction with the natural environment remains high and the opportunity for use of motorized equipment is added.
(RN)	Roaded Natural	Characteristics of this classification include a natural appearing environment within roaded areas, prevalent evidence of other users, and evidence of past resource management activities. RN areas are predominately natural appearing but are readily accessible to vehicles.
(R)	Rural	Natural setting is culturally modified to the point that it is dominant to the sensitive travel route observer. There is strong evidence of designed roads or highways. A rural setting is easily accessible and structures are readily apparent.
(U)	Urban	Characteristics of this classification include a setting that is strongly dominated by structures and/or resource development. Natural appearing elements may be present, but are subordinate. There is strong evidence of designed roads and human activity both on-site and in nearby areas. Motorized access to the area is the norm.

Source: USDA 1986

Currently the Uncompahgre National Forest has a total of 48 permitted outfitters. These permits range from mushroom picking to river rafting to heli-skiing. Recreational use is one of the primary uses of public lands in San Miguel and Montrose County. Hunting is an important activity on both public and private lands. There are currently 13 permitted outfitters providing guide services within the project area. In 1997, 13,890 elk hunters, 11,112 deer hunters, and 102 mountain lion hunters hunted in game management units within or

adjacent to the project area (CDOW 1998). The estimated economic impact of direct and secondary resident and non-resident big and small game hunting expenditures in San Miguel County in 1996 was $8.3 million and $24 million in Montrose County. (CDOW 1997).

The BLM reported approximately 18,856 visits to the San Miguel River Special Recreation Management Area (SRMA) in 1998. Total use for 1996 and 1997 was estimated at approximately 9,365 and 18,636 visits, respectively (BLM 1996-98). These visits include boat launches (kayaking and rafting), fishing, picnicking, and ice climbing within the SRMA. Boating use on the river is two-thirds kayakers and one-third inflatables (private and commercial rafts). Boating use of the river is increasing steadily, but does not exceed the capacity of the river (Sullivan 1999, pers. comm.). Camping is discouraged along the San Miguel River corridor except in designated areas (*i.e.*, above Specie Creek, upstream of Piñon Bridge, below Beaver Creek). Boating and fishing use on the river is somewhat related to flow levels. Since the river is not dammed, natural snow conditions affect runoff and, therefore, river usage.

Snowmobiling at Alta Lakes has an estimated 5,000 users per winter (Dunkelberger 1999, pers. comm.). Four permitted mountain bike outfitters operate in the national forest, mostly along the Galloping Goose Trail. Outfitters provide services to an estimated 2,000 mountain bikers each summer (Dunkelberger 1999, pers. comm.). Private bikers are not included in this estimate. Dispersed recreational use within the project area for BLM lands was estimated at 60,851 visits in 1998, 51,429 visits in 1997, and 34,500 visits in 1996. These estimates show an increase of 76 percent in the three-year period and represent dispersed use and visits to the following sites: Bedrock, Hanging Flume Byway, Paradox Valley Climbing Area, and Tabeguache Area, which are all BLM sites within the project area. These figures do not include scenic driving.

Forest Service 1996 Recreation Management Information Data shows that scenic driving represents 49.4 percent of all forest users, followed by downhill skiing, 19.1 percent, camping, 7.4 percent, and other recreational activities, 24.1 percent (USDA 1996b). Forest Service campgrounds in the project area include Matterhorn (28 sites), Sunshine (14 sites), and Sheep Corral (8 primitive sites). Campgrounds are open from May through September. The Sunshine Campground will be closed during the 1999 season for improvements and will add an additional two to three campsites. Matterhorn Campground had 4,992 users in 1998, and Sunshine Campground had 2,807 users in 1998, an increase of approximately 12 percent over 1997 (High Country Recreation 1999). Currently there is a shortage of campgrounds in the project area at certain times in the summer resulting in problems in areas where camping is not desirable (*e.g.*, along the San Miguel River). The Mary E. Day Use Area is also located in the project corridor in the Ilium Valley. Camping in the day use area is allowed only during the Telluride Bluegrass Festival.

The Telluride Ski Area provides both summer and winter recreational activities within the project area. Winter use is the primary recreational use of the ski area, with a full range of activities including alpine skiing and snowboarding. Other activities at the mountain include Nordic skiing, snowmobiling and heli-skiing in the winter, and hiking, mountain biking, and horseback riding in the summer. For the past five years skier days at Telluride have totaled over 300,000, except for 1995-96, with the 1997-98 ski year setting a record 375, 027 skier days. The average annual change in skier days over the period 1993-94 through 1997-98 is 5.7 percent, a significant growth rate. Telluride captures over eight percent of the total non-Front Range destination resort market share, and three percent of the market share for all ski resorts in the state. *Table 3.9-2* shows a comparison of skier days for Telluride and other destination resorts in the southwest Colorado Rocky Mountains.

The expansion rate of the Colorado ski industry as measured by the number of tickets sold has slowed, and modest growth rates are likely to continue. However, year-round visitation of the mountain resort industry is rapidly increasing. The future of destination ski resorts is

promising, due to increasingly sophisticated marketing, customer services provided, an increasing international market, and air access improvements (Brown et al. 1992). Destination skier visits are tied to the availability of accommodations (number of beds) in an area. In 1997 the bed base was estimated at 4,387 (Daranyi 1997). Telluride is projected to have an estimated bed base of over 6,300 by the end of 1999. The Mountain Village would account for over 77 percent of the tourist pillows. The effort to increase the short-term bed base appears to be in response to current and anticipated future demand from destination skiers who make up 78 percent of all skiers in Telluride. (USDA 1996a) However, certain building requirements, particularly the provision to provide so many units of employee housing, has affected growth in the short-term, temporary bed base.

Table 3.9-2
Skier Days 1993-94 through 1997-98

Resort	1993-94	1994-95	1995-96	1996-97	1997-98	Avg. Ann. Change 93-94 / 97-98
Telluride	300,388	301,748	270,916	306,507	375,027	5.7
Crested Butte	530,088	485,840	507,309	519,250	549,660	0.9
Monarch	158,148	162,982	136,074	145,733	148,160	(1.6)
Purgatory	302,103	382,839	307,442	341,643	328,705	2.1
Wolf Creek	140,456	157,995	124,478	152,971	158,235	3.0

Colorado Ski Country 1999

Summer use at the Telluride Ski Area is rising with the increased popularity of mountain biking and other mountain activities (hiking and hang-gliding).

The Mount Sneffels and Lizard Head Wilderness Areas are located approximately two to three miles from the project alternatives. The wilderness areas provide spectacular backcountry recreational opportunities for local and non-local visitors in a primitive environment. The primary uses of the wilderness areas are backpacking, horsepacking, hiking, hunting and skiing. Wilderness use represented 3.1 percent of total recreational use in the Norwood District in 1996.

Resources Within the Project Alternative Corridors

The current recreational use on public lands crossed by the project alternatives is limited throughout most of the corridors. Existing and planned recreational sites within the project alternative corridors are shown in ***Plate REC-1***. In the western part of the project area, public lands are used primarily for a number of dispersed recreational pursuits such as hunting, hiking, rock hounding, backcountry exploring, wildlife viewing and photography. Elk, deer, mountain lion and small game hunting occur within the alternative corridors and throughout the project area on public and private lands. Primary hunting season is from August 20 through November 20. Public land areas of dispersed recreational use within the western and central portions of the project alternatives are primarily concentrated in the vicinity of Naturita Canyon and McKee Draw, Beaver Canyon and Saltado Creek. The Beaver Canyon and Saltado Creek areas are part of the BLM's San Miguel River Canyon Special Recreation Management Area (SRMA) and Area of Critical Environmental Concern (ACEC). Other dispersed recreation in this area includes scenic driving along the San Juan Skyway Scenic Byway, the Unaweep-Tabeguache Scenic Byway, hiking, rock hounding, and backcountry exploring.

East of Silver Pick Road to the Telluride Substation, recreational activity is more concentrated within the project area, primarily along the San Miguel River and South Fork of the San Miguel River. Stretches of the San Miguel River, South Fork of the San Miguel River and the Galloping Goose Trail are located along portions of the alternative corridors. Summer recreational activities in these areas include rafting and kayaking (May through July), fishing,

hiking and mountain biking. Within the immediate vicinity of the project alternative corridors, camping is limited to the Mary E. Day Use Area (during the Telluride Bluegrass Festival), situated along the South Fork of the San Miguel River, in the Ilium Valley. In the summer of 1998, 910 people were counted on the Galloping Goose Trail on a weekend day (Dunkelberger 1999, pers. comm.). Winter activities along the corridor include ice climbing in certain drainages, cross-country skiing, and snowshoeing. Sightseeing along the San Juan Skyway Scenic Byway (State Highway 145) is a very popular activity in both the summer and winter. In 1996 over 201,000 Recreational Visitor Days (an RVD represents one person spending 12 hours recreating in a national forest) were estimated driving along the San Juan Skyway (USDA 1996b). Mechanized travel and viewing scenery accounted for over 49 percent of all estimated recreation use in the forest in 1996. The RVD estimate lessens the actual number of vehicles passing through the area by definition. In 1997, average annual traffic over Lizard Head Pass was nearly 600,000 vehicles. During the same period, at Society Turn on Highway 145 near the Town of Telluride, average annual traffic was 2.2 million vehicles.

FUTURE RECREATIONAL DEVELOPMENT AND USE

The demand for recreational resources throughout the project area is expected to continue to increase in response to increases in population, expansion of existing recreational opportunities and facilities, and continued marketing of the region. Increased demands on recreation will affect those principal providers of resources and facilities, namely the Uncompahgre National Forest, public lands administered by the BLM, San Miguel County, Mountain Village, and the Town of Telluride. Population projections for the Town of Telluride and the Mountain Village are projected to increase 3.0 percent annually for baseline growth, which would represent full build-out by the year 2020 (CPAC 1998). This growth rate coincides with resource managers' projections on recreational use (Dunkelberger 1999, pers. comm.). Continued population growth and increased marketing of the Telluride area will continue to have an overall effect on the use of the developed facilities in the national forest, state parks, and BLM lands. The largest pressure on public lands will occur in closer proximity to Telluride than to the western end of the project area. Overuse of natural resources has not yet become a problem, even though use rates have increased with the growing population. Resource managers are keenly aware of the effects of increased population and are proactively planning for resource management and development.

Improvements currently planned by the Forest Service in the next few years include 1) Sunshine Campground reconstruction; 2) extension of Sneffels High Line Trail (east of the existing trail); 3) construction of a trail from the Lawson Hill subdivision to the Mountain Village entrance; 4) extension of the Galloping Goose Trail along the railroad grade to Placerville as part of Skyway Trail; 5) construction of the final segment of the Galloping Goose Trail between the underpass and Matterhorn Campground; and 6) expansion of the Telluride Ski Area.

Improvements currently planned by the BLM in the next several years include construction of: 1) Leopard Creek interpretive turnout, trail and parking on the Leopard Creek/SH 62 corridor northeast of the intersection on SH 145; 2) the Leopard Creek Trail as part of Skyway Trail; 3) toilets, group picnic pavilion, and reconstruction of an existing cabin on-site at the Norwood Hill Recreation Site/Living Classroom; 4) the Applebaugh County Park with playing fields, picnic shelter, restrooms, boater take-out (in coordination with San Miguel County); 5) the Piñon Bridge boater take-out improvements and Ledges Campground; 6) the Beaver Creek camping area with boat launch; and 7) fisherman access parking between Sawpit and Deep Creek.

The Telluride Region (San Miguel County, Town of Telluride, Mountain Village) also has long-term plans to provide many new and expanded recreational resources including the following: expand cross-country skiing and trails, expand and develop additional parks and facilities, ball fields, sports complexes, community center, golf course, and performing arts center (CPAC 1998).

3.9.2 ENVIRONMENTAL CONSEQUENCES

3.9.2.1 ANALYTICAL FRAMEWORK

Potential Types of Impacts

The EIS impact analysis documents the potential recreational use conflicts that may occur during the construction and operation of the Action Alternatives; and whether the Project is consistent with the Forest Service and BLM Recreation Opportunity Spectrum (ROS). The types of effects anticipated include impacts related to the aesthetic recreational experience in a mountain setting (views, solitude, quiet, etc.), impacts to recreational resources from construction activities such as limiting use of resource or recreation areas, and impacts related to recreational access.

Impact Levels

The potential degree of conflict with recreational resources that could result from the project alternatives is characterized by to the following qualitative impact levels.

High Impacts would occur if:

- a developed recreation site would be directly affected by the project facilities or right-of-way restrictions.
- the presence of the 115 kV line or other project facilities would result in a substantial decrease in the quality of regionally significant recreational resources, long-term for the life of the Project. This would apply to lands that depend upon the naturalness of the setting for the quality of recreational experiences.
- recreational activities or use of recreational resources would be prevented or impeded for more than one day during high use summer or weekend periods due to construction activities.

Moderate Impacts would occur if:

- the construction of the Project would result in a substantial decrease in the quality of recreational experiences, short-term, due to construction-related noise, dust and traffic effects.
- the presence of the Project could potentially have long-term adverse effects on recreational resources of local importance or open space land use by affecting the naturalness of the setting.

This may have the potential to reduce use of the area or diminish the qualities of naturalness and solitude important to dispersed recreational experiences.

Low Impacts would occur if:

- the construction of the Project would result in a minor decrease in the quality of recreational experiences, short-term, due to construction-related noise, dust and traffic effects.
- Construction or operations activities would have minor, short-term effects on access to or availability of recreational activities.

Applicable Permits, Standards and Ordinances

The USFS and BLM provide management prescriptions and ROS classes and characterizations, respectively, for land within their jurisdictions. Recreation-related management prescriptions are discussed in Section 3.9.1. The conformity of the Project with ROS classes is addressed Section 3.9.2.

Environmental Protection Measures

In order to minimize the potential recreation impacts in the project area, the following Environmental Protection Measures (EPM) would be implemented for any of the action alternatives: *Table 2.2-4* Tri-State Standard Mitigation Measures, numbers 36, 37, 38, and 39; and *Table 2.2-5* Watershed Conservation Practices for the Nucla-Telluride Transmission Line Project, Forest Service Standard Best Management Practices and BLM Required Construction Practices, numbers 6, 7, 16, and 24.

These EPMs have been taken into consideration in assessing impacts on public (*Tables 2.2-4* and *2.2-5*) and private lands (*Table 2.2-5*).

3.9.2.2 IMPACTS OF THE PRIMARY TRANSMISSION ALTERNATIVES

Nucla-Norwood Northern Alternative

115 kV Transmission Line Effects

The Nucla-Norwood Northern Alternative would cross 1.5 miles of BLM land and would parallel the Unaweep-Tabeguache Scenic Byway for approximately 12.0 miles.

The byway showcases 135 miles of scenic mesas and canyons. Scenic driving in the region is very popular and receives most of the vehicle miles traveled in the summer and fall months. Other recreational activities along this section are limited.

Recreation Opportunity Spectrum (ROS). BLM lands crossed by the alternative alignment are categorized as Semi-Primitive Motorized (SPM). Other ROS categories within the surrounding area include RN, SPM, and SPNM. The applicable ROS classifications would not change with the proposed Project. No identifiable impacts to ROS classifications would result from construction, operation, or maintenance of the Project.

Recreational Resources and Activities. This alternative would have no identifiable impacts on the existing dispersed recreational activities occurring in the project area, except hunting and scenic driving. Short-term impacts to scenic drivers along SH 145 and SH 141 may occur during the construction phase. These impacts would occur primarily on Link 1 between mile markers 2 and 8, where construction activity would be immediately adjacent to the highway. This impact would represent a moderate impact to the Unaweep-Tabeguache Scenic Byway during the construction period. Short-term low impacts to hunters on private and public lands may occur. Visual effects of the proposed 115 kV line are discussed in Section 3.10, Visual Resources.

Substation Effects

Modifications to the Nucla Substation and the expansion of the Norwood Substation would have low to no identifiable impacts on dispersed recreation activities and resources within the project area.

69 kV Transmission Line and Distribution System Effects

Since this alternative is a rebuild of the 69 kV line, no additional impacts would occur beyond those described above for the 115 kV transmission line. Similarly, no additional impacts from distribution system modifications would be anticipated.

Nucla-Norwood Central Alternative

115 kV Transmission Line Effects

Recreational activities are primarily limited to dispersed uses on pubic BLM lands and private lands used for hunting. Public lands are crossed for approximately 5.8 miles by the alternative alignment. Some BLM lands are also adjacent to this alignment, principally in the vicinity of the Montrose/San Miguel County boundary.

Recreation Opportunity Spectrum (ROS). The ROS category identified for BLM lands along this alternative alignment is SPM. Other ROS categories in the surrounding area include RN, SPM, and SPNM. The applicable ROS classifications would not change with the proposed Project. No impacts to ROS goals are identified.

Recreational Resources and Activities. The Nucla-Norwood Central Alternative would have low to moderate effects on the quality of dispersed recreational activities particularly during hunting season, which runs from late August through November, with October and November being peak season. Construction activities occurring during the hunting season may include surveying and staking, access development and particularly clearing along the right-of-way. The quality of dispersed recreational uses may also be affected, particularly at the crossing and along the northern edge of Naturita Canyon that is of local importance for recreation activities including fishing, hiking, wildlife viewing, etc. Low impacts to dispersed activities in other areas may result, affecting such activities as scenic viewing, rockhounding, small game hunting and exploring could also occur. Noise impacts are discussed in Section 3.13, Noise. Visual effects of this alternative are discussed in Section 3.10, Visual Resources.

Substation Effects

Substation effects would be the same as described for the Nucla-Norwood Northern Alternative. Low to no identifiable impacts are anticipated.

69 kV Transmission Line and Distribution System Effects

Low to no identifiable adverse effects are anticipated. The dismantling of the existing 69 kV line would result in short-term, low, adverse effects. However, long-term effects of removing the 69 kV line would be beneficial, primarily to the quality of viewing experiences along the Unaweep-Tabeguache Scenic Byway. No additional impacts from distribution system modifications would occur to recreational resources.

Nucla-Norwood Southern Alternative

115 kV Transmission Line Effects

The Nucla-Norwood Southern Alternative alignment would cross public BLM lands for 9.0 miles. Recreational activities are mainly limited to public BLM lands and private lands used during the hunting season.

Recreation Opportunity Spectrum (ROS). The ROS category identified for BLM lands along this alternative alignment is SPM. Other ROS categories in the surrounding area include RN, SPM,

and SPNM. The applicable ROS classifications would not change with the Project. No impacts to ROS goals are identified.

Recreational Resources and Activities. The proposed Project would have similar effects on the quality of dispersed recreation, as described for the Nucla-Norwood Central Alternative. However, a central section of Naturita Canyon would be crossed by this alternative. The remote beauty of the area provides the dispersed recreationist a unique experience when recreating within the canyon or on the canyon rim. The short-term impact from the project construction would be considered moderate within the area of Naturita Canyon. Short-term impacts to the quality of recreational experiences would result from helicopter construction noise and activities, and the presence of construction crews and equipment on the canyon rim. The duration of impacts would be intermittent and last no longer than two to three days at a time. Low impacts to other areas used for dispersed activities such as scenic viewing, rock hounding, small game hunting and exploring would be expected due to the low volume of use. Noise impacts are discussed further in Section 3.13. The long-term visual effects of the proposed 115 kV line for this area are discussed in Section 3.10.

Substation Effects

Substation effects would be the same as those described for the Nucla-Norwood Northern Alternative. Low to no identifiable impacts are anticipated.

69 kV Transmission Line and Distribution System Effects

Impacts associated with dismantling the 69 kV line and making other changes to SMPA's distribution system would be the same as those described for the Nucla-Norwood Central Alternative.

Norwood-Sunshine Alternative

115 kV Transmission Line Effects

The Norwood-Sunshine Alternative would consist of rebuilding the existing 69 kV line to 115 kV, and would cross 1.1 miles of BLM land, 1.1 miles of Forest Service land, and 0.6 mile of Colorado State land. Helicopter construction would be used across the San Miguel River Canyon ACEC.

Recreation Opportunity Spectrum (ROS). National Forest lands crossed by the alternative alignment have been designated RN in the Forest Plan. In the surrounding area, ROS categories also include SPM and SPNM. The ROS designations would not change with the proposed Project. Consequently, no identifiable impacts to ROS classifications would result from construction, operations, or maintenance of the Project.

San Miguel River Canyon ACEC and SRMA. This alternative crosses lands designated by the BLM as part of the San Miguel River Canyon ACEC and SRMA in the Resource Management Plan. The BLM's goals and objectives for protecting environmental resources and recreational values are discussed in Section 3.8, Land Use.

Recreational Resources and Activities. Limited developed or undeveloped public recreational resources within the Norwood-Sunshine Alternative project area exist since most of the surrounding land is private. Much of the land use along this alternative is rural subdivisions and estate ranches. Faraway Ranch is a private recreational area located within the corridor on Wilson Mesa. Among other activities, the ranch provides opportunities for horseback riding.

Private individuals also participate in dispersed recreational activities on private lands, enjoying the forests, mesas, mountain vistas, peace, quiet, and general rural character of the area. Since the route would follow the existing 69 kV line route and would not change the recreational opportunities in the area, impacts to recreation in the area would be considered low to moderate during construction. Helicopter construction methods would be used on 4.2 miles of the line near Fall Creek Road and the Sunshine Substation. Impacts to recreational activities during operation of the Project would result from visual changes, discussed in section 3.10, Visual Resources.

Substation Effects

The expansion of the Sunshine Substation would have a low effect on recreation within the project area. Construction noise may affect the aesthetics of recreational activities within the vicinity of the substation including the Galloping Goose Trail, located less than 0.5 mile to the west.

The removal of the Oak Hill Substation and modifications to the Wilson Mesa and Specie Substations would have short-term, low impacts on the dispersed recreational activity in the immediate area due to construction noise.

69 kV Transmission Line and Distribution System Effects

No additional impacts to the quality of recreational lands or experiences would result from SMPA's distribution system modifications. Impacts associated with upgrading the 69 kV line to 115 kV are described above.

Norwood-Telluride Alternative

115 kV Transmission Line Effects

The Norwood-Telluride Alternative would cross 6.3 miles of BLM land, and 0.7 mile of Forest Service land. Helicopter construction would be used across the San Miguel River Canyon ACEC and along the upper benches of the San Miguel River Canyon.

Recreation Opportunity Spectrum (ROS). The ROS category for BLM lands crossed by the alternative alignment is Roaded Natural (RN), SPM and SPNM designations exist in the surrounding area. No identifiable impacts to ROS goals would result from construction, operations, or maintenance of the Project.

San Miguel River Canyon ACEC and SRMA. This alternative crosses lands designated by the BLM as part of the San Miguel River Canyon ACEC and SRMA in the Resource Management Plan. The BLM's goals and objectives for protecting environmental resources and recreational values are discussed in Section 3.8, Land Use.

Recreational Resources and Activities. This alternative could have moderate to high short-term impacts to recreational activities and resources during the construction period. Recreational activities affected by the construction phase would primarily be those activities occurring along the San Miguel River corridor including cross-country skiing, ice climbing, snowshoeing, rafting, kayaking, fishing, hiking, mountain biking, camping, tourists visiting the area and sightseeing along the San Juan Skyway Scenic Byway. These impacts would occur primarily on Link 20 and Link 21, where construction activity would be immediately adjacent to the river and highway. Construction activities that are scheduled in November and December include surveying and staking, access development, clearing, and wire stringing the

following year. The construction activity scheduled during the months of May and June is excavation. Structure assembly is scheduled for late August and September. The recreational experience could be affected by construction noise, visual impacts, access problems, deterioration of the resource, and having resources taken out of use for short periods of time (Galloping Goose Trail, river access, etc.). Recreation resources affected by construction of the proposed Project include the San Miguel River, the Galloping Goose Trail, Mary E Primitive Campground, boater put-ins at Bilk Creek and Deep Creek, and parking alongside Highway 145 for fishing access. Impacts to the quality of recreational experiences would be particularly noticeable along the Galloping Goose Trail, east of Ilium Valley, where the 115 kV line would be located along the trail edge for approximately 1.5 miles. Impacts to recreational uses and quality of experiences would also be more acute during periods of helicopter construction along the San Miguel River Canyon ACEC and SRMA. Short-term impacts related to helicopter construction noise may also affect solitude qualities of the Mount Sneffels Wilderness Area, and the quality of recreational experiences along the Last Dollar Road and other backcountry roads and trails. ***Plate REC-1*** shows the location of recreational resources and activities in relationship to the alternative alignment and corridor.

In addition, construction activities may impact travelers along the San Juan Skyway Scenic Byway and tourists traveling to Telluride or the Mountain Village for any of the many festivals or other promoted activities Telluride markets each summer and winter. These would be short-term, moderate, construction-related impacts.

Recreation activities along other portions of the line would experience low to moderate impacts during the construction phase and low impacts when the line is operational, primarily from noise and visual impacts, respectively.

Once the transmission line is operational visual impacts would still be evident. Visual, transportation and noise effects of the proposed 115 kV line are discussed in Sections 3.10, 3.12, and 3.13, respectively.

Substation Effects

The expansion of the Telluride Substation would have low or no identifiable effect on recreation within the project area. Construction noise may affect the aesthetics of recreational activities within the vicinity of the substation. However, impacts of noise and construction activities would be limited since the substation is located along Highway 145 in a commercial/industrial zone where noise from ongoing traffic or industrial activity is prevalent.

The removal of the Oak Hill and Wilson Mesa Substations may have short-term impacts ranging from low to no identifiable effect. Both substations are located on private lands, where dispersed recreation activities would be very limited.

69 kV Transmission Line and Distribution System Effects

The 1.0 mile of distribution line that would be undergrounded west of the Telluride Substation would have high short-term, construction-related impacts on recreation since it would close the Galloping Goose Trail for approximately one week (Mundorff 1999, pers. comm.). Recreational activities along the South Fork of the San Miguel River and at the Mary E Primitive Campground would also be impacted to a moderate degree. Impacts to these areas would result from conventional and helicopter construction noise and dust, as well as possible short-term access limitations. Removal of the 69 kV line would result in low adverse impacts to recreational uses on the National Forest lands, although long-term effects would be beneficial.

3.9.2.3 IMPACTS OF THE SUBALTERNATIVES

115 kV Transmission Line Routing Alternatives

Subalternative A. Subalternative A would impact recreational uses in Naturita Canyon during project construction and operation, by locating the line in the bottom of the canyon. Local residents who provided comments during the scoping period consider recreational uses of this area important. Uses include hunting, fishing, wildlife viewing, and other activities that depend, in part, upon the natural remote character of the landscape for their recreational value. Construction-related impacts of noise and dust from equipment and crews would be short-term in duration and are moderate in degree. Long-term visual effects are described in section 3.10, Visual Resources.

Subalternatives B, C and D. Low to no identifiable impacts to recreation would occur with Subalternative B, Subalternative C, and Subalternative D. These subalternatives are located on private lands, with no or limited public recreational opportunities.

Subalternative E. Subalternative E would have short-term moderate impacts on the planned expansion of the Galloping Goose Trail. These impacts would be similar to those described above for the Norwood-Telluride Alternative 115 kV transmission line.

Underground Subalternative

The underground subalternative would cause short-term impacts to dispersed recreational activities that occur on private lands on or near Beaver, Specie, Wilson and Sunshine Mesas. These impacts would be somewhat greater in duration and intensity than those reported for the Norwood-Sunshine overhead transmission line since the construction of the underground line would require increased equipment and construction activities. Long-term visual effects to recreational experiences and resources would be beneficial, however. Developed recreation areas benefiting from this subalternative would include Faraway Ranch on Wilson Mesa, as well as general populations using the mesas. The long-term visual effects are discussed further in Section 3.10.

Norwood Substation Alternative Site B

No identifiable impacts to recreation would occur with construction of a new Norwood Substation on private land, approximately 1.0-mile southeast of the existing substation.

3.9.2.4 CUMULATIVE EFFECTS

Cumulative impacts relate to reasonably foreseeable projects that could be developed within the project area in the near future. In the Telluride area and in rural San Miguel County there are a few projects already proposed and in the planning stages, some of which would have high impacts on the recreational opportunities of San Miguel County. These projects include the Telluride Ski Area expansion, continued build-out of Telluride and Mountain Village, Uncompahgre National Forest Travel Plan, San Miguel Hydroelectric Project, expansion of Galloping Goose Trail, Norwood Hill Recreation Site improvements, Leopard Creek Trail and Parking, Applebaugh County Park, and upgrading Mary E Primitive Campground. Other smaller improvements are also planned along the river corridor, such as improving access and parking for river users.

Expansion of the Telluride Ski Area and the continuing development in Telluride and Mountain Village would have the greatest cumulative impacts on recreation in the area. These projects would increase the number of recreation users in the area, putting more pressure on recreational resources. However, during the construction phase of the Norwood-Telluride Alternative, the major impacts from these projects, in combination with the Nucla-Telluride

Project, would be related to recreation access along the river. Construction activities in all areas would increase traffic congestion and affect access to recreational resources. The San Juan Skyway Scenic Byway would be further impacted with these cumulative projects.

Construction of some of the planned BLM and Forest Service recreational resource development projects could be impacted by construction activities occurring along the Norwood-Telluride Alternative. The Leopard Creek project, Applebaugh Park project, Deep Creek boater put-in improvements, and Galloping Goose Trail expansion do not have definite schedules for construction currently. However, development of these projects is anticipated within the next two to three years, which would coincide with development of the transmission line. Impacts from construction activities would be exacerbated with the development of these recreation projects.

The San Miguel Hydroelectric Project is proposed for the same area where most of the construction impacts from the Norwood-Telluride Alternative would occur. If the San Miguel Hydroelectric Project was developed at the same time as the construction on the Norwood-Telluride Alternative, impacts already described would be exacerbated.

3.9.2.5 POTENTIAL MITIGATION MEASURES AND RESIDUAL EFFECTS

Potential mitigation measures include the following:

- Reschedule construction activities to occur during non-prime hunting season in key hunting areas to eliminate low to moderate hunting impacts along the Nucla-Norwood Central and Nucla-Norwood Southern Alternatives.
- Suspend construction activities during peak festivals in Telluride, particularly the Bluegrass Festival in June, the Wine Festival in late June, July 4th weekend, the Mountain Bike Classic in late July and early August, the Jazz Festival in early August, the Mushroom Festival in late August, the Telluride Film Festival on Labor Day weekend, and Blues and Brews in mid-September. Conflicts with tourists, tourist traffic, camping at the Mary E Primitive Campground, and use of the Galloping Goose Trail by bikers and hikers would be minimized if this mitigation measure is implemented. Impacts to recreationists during these periods would be reduced to low impacts.
- Avoid installation of poles at all boater put-ins, take-outs, parks, ice climbing areas, and other undeveloped and developed recreation areas to avoid conflicts with these activities and minimize changes to the naturalness of the environment. This mitigation measure would reduce moderate impacts to recreationists to low impacts.
- Site poles in areas with vegetative screening to reduce changes in the natural appearance of the environment and river corridor. When possible, install pole spans with the minimum allowable height to reduce changes to the natural environment.
- Provide a detour, with signage, for the Galloping Goose Trail during undergrounding of the distribution line along this segment of the project. The high impact related to the one week of trail closure would be reduced to a moderate impact.
- Provide alternate access to all recreational resources and facilities, when possible, to minimize moderate impacts related to construction activities.

With implementation of the above mitigation measures, impacts to recreational resources would be reduced from high or moderate to moderate to low levels.

3.9.2.6 IMPACTS OF THE GENERATION ALTERNATIVES

The degree to which a Distributed Generation Alternative would affect recreational resources would vary depending upon final siting and engineering design. Issues include the potential

impacts to wilderness areas due to impaired visibility from generator emissions, as well as the short-term effects from construction (noise, dust, traffic, etc.) and long-term operation consequences (visual) to developed and dispersed recreational areas and activities.

Potential visibility impacts to Class I and II Wilderness Areas are discussed in Sections 3.2 and 3.8. With respect to other recreation-related issues, the impacts of the Generator Alternatives would vary depending upon the final siting of the facility. Preliminary alternative sites identified on private lands near the Telluride Substation and the sand and gravel facility in Ilium Valley would have less effect on the quality of recreational experiences than a site in the national forest or one in close proximity to public campgrounds or the Galloping Goose recreation trail. Compared to the Transmission Alternatives, the Generator Alternatives would have greater impacts overall. In addition to the visibility impacts to wilderness areas and generator siting effects, additional impacts from transmission modifications would be similar to those described previously for the Nucla-Norwood and Norwood-Sunshine Alternatives.

3.9.2.7 NO ACTION ALTERNATIVE

Demand for recreational activities in San Miguel and Montrose Counties, including both summer and winter activities, would continue to increase with the resident, seasonal and visitor populations. Baseline growth in the area is sufficient to add substantial demand to the existing recreational opportunities and require additional capital improvements to maintain the existing level of service and to meet growing demand.

Under the No Action Alternative construction of the proposed 115 kV transmission line would not occur. Power would continue to be supplied by the existing Cascade to Sunshine 115 kV line with the Nucla to Sunshine 69 kV line as a backup. As mentioned in Chapter 2 degradation in the quality of service would occur when future backup power demands exceed the 69 kV capacity of 13 MWs. This could adversely impact recreational activities in the region if major power outages occurred, affecting the operation of major resort operations in Telluride including the Telluride Ski and Golf Company and other businesses catering to the tourist population.

There would be no changes in the current management prescriptions of the land proposed for development. The current ROS classification would remain the same, and the existing recreational resources and activities would not change dramatically.

3.10 VISUAL RESOURCES

ISSUES: The project area contains diverse landscapes of the Uncompahgre Plateau and the San Juan Mountains that are recognized both regionally and nationally for their exceptional visual quality. Specific issues raised during scoping included protecting views from the scenic byways, the San Miguel River Corridor, and other public areas such as heavily traveled recreation roads. Siting suggestions included locating the Project to minimize impacts to scenic vistas and long lines-of-sight, as well as using vegetation to screen the facilities where possible.

3.10.1 AFFECTED ENVIRONMENT

LANDSCAPE CHARACTER TYPES

The project area spans portions of two physiographic provinces – the Uncompahgre Plateau and the San Juan Mountains. The visual quality of the region is strongly influenced by farming and ranching, and the spectacular scenery afforded by the San Juan Mountains, the San Miguel River and its tributaries. The Uncompahgre Plateau comprises the majority of the project area from Nucla to west of Telluride. The fringes of the San Juan Mountains are encountered in the eastern extent of the project area, near Telluride. The San Juan Mountains, provide a dramatic scenic backdrop to many settings in the project area.

The following natural and cultural landscape character types are encountered in the project area and are shown in ***Plate VISUAL-1***:

- Uncompahgre Plateau: Flat to Rolling Pinyon-Juniper Shrub Landscapes – Open space natural landscapes in the western and central parts of the project area primarily support pinyon-juniper and shrub/grassland vegetation communities that form a visually homogeneous landscape character. Visibility conditions in pinyon-juniper landscapes are limited by the tree canopy, except where open shrub or grassland meadows occur or on vista points. Few cultural modifications are typically found in these areas, although several utility corridors, including transmission and pipeline facilities traverse the area.
- Uncompahgre Plateau: Farming and Ranching Landscapes – Principally found in the western part of the project area, on Wrights Mesa, these cultural landscapes are characterized by broad open irrigated valleys, supporting pastoral horse and cattle ranches. Natural scenic amenities primarily include distant views to adjacent scenery: the La Sal Mountains to the west, Lone Cone to the south, and peaks of the San Juans to the southeast. Farming and ranching landscapes contain numerous cultural modifications including homes, farm buildings and improvements, powerlines, and fences.
- Uncompahgre Plateau: San Miguel River, Tributaries and Canyons – The San Miguel River flows east-west through the project area and is the major natural water feature. The San Miguel River and its tributaries have cut a number of north-south trending canyons into the plateau. These include Naturita Creek in the western part of the project area; and in the central and eastern parts of the project area, Beaver Creek, Saltado Creek, Fall Creek, Bear Creek, and Bilk Creek. The visual character of these canyons is predominantly natural and is characterized by steep enclosed canyon walls, massive rock and geologic outcroppings, and/or diverse riparian vegetation patterns along the rivers and creeks. Cultural influences are generally lacking, although paved and unpaved roads, distribution lines and rural developments occur intermittently along the San Miguel River Canyon and portions of some of the tributaries.
- Uncompahgre Plateau: High Mesas With Adjacent Mountain Scenery Influences – A number of the mesas in the central and eastern part of the project area are characterized by natural meadows and aspen groves, dispersed residences and scenic views of the San

Juan Mountains. These mesas include Beaver Mesa, Specie Mesa, Wilson Mesa and Sunshine Mesa. The visual character of the mesas is predominantly natural and overhead powerlines are few to nonexistent. Cultural modifications typically include dispersed residences, historic ranching remnants, fences and local road systems.

- San Juan Mountains: Mountain Slopes and Ilium Valley – The eastern extent of the project area encompasses the Ilium Valley and adjacent mountain slopes and benches. Dominant natural visual features in this area are the South Fork of the San Miguel River, the narrow enclosed river valley and the steep adjoining mountain slopes that are characterized by diverse conifers and aspens as well as massive rock outcroppings. Cultural features include several transmission lines that traverse the valley, as well as various land uses at the northern end, including industrial, commercial, and public facilities in the Ilium Industrial and Business Park, and residential uses.

VISUAL SENSITIVITY AND DISTANCE ZONES

Visual sensitivity is a measure of people's concern for the visual environment. Visual concerns, related to this project, emerged as a primary issue during scoping. The scoping record reflects that over 50 percent of the commenters raised visual concerns regarding the Project. Visual sensitivity is especially acute in the central and eastern portions of the project area where landscapes are either part of, or highly influenced by, the dramatic scenery of the San Juan Mountains. The importance of scenic quality to both the economy and marketing of the Telluride region is documented in the Telluride Visitor Guide web site (www.telluride.org) that provides a wealth of information on the region and stresses the scenic quality on most of its web pages. Protection of visual resources is also reflected in the plans and policies of the Forest Service for the Uncompahgre National Forest (Forest Plan 1991) and by the BLM (RMP 1984) for BLM lands in the region (see Section 3.8, Land Use). In response to the scoping record and other available information on the region, the visual sensitivities of project area landscapes have been assessed as high to moderate in this EIS, depending upon viewer attitudes and viewer exposures to the project alternatives. Sensitive viewers addressed in this analysis include residents, travelers along highways and major roadways, and recreation users of developed or designated sites or resorts, trails, designated wilderness areas, and other public lands managed by the Forest Service or BLM for visual or recreational purposes.

Three distance zones were considered in the assessment of visual sensitivity: Foreground Distance Zone (FG) – within 0.5 mile of the Project; Middleground Distance Zone (MG) – within 0.5 to 3.0 miles; and Background Distance Zone (BG) – beyond 3.0 miles. The following section describes types of sensitive viewers and their respective distance zones from the project alternatives. Visually sensitive areas were documented from the land use and recreation studies and field reconnaissance (see ***Plates LAND-1, LAND-3,*** and ***REC-1***).

DESIGNATED SCENIC BYWAYS AND MAJOR ROADS

The San Juan Skyway National Scenic Byway. The San Juan Skyway Scenic Byway is a 236-mile scenic loop through the San Juan Mountains of southwestern Colorado, that includes portions of SH 145, 62, 550, and 160. The San Juan Skyway Scenic Byway was one of the first road systems designated as part of the Forest Service's scenic byway program in 1988. Within the project area, the San Juan Skyway Scenic Byway includes a small section of SH 62 and SH 145, east of its intersection with SH 62. This portion of the byway provides scenic views to the San Juan Mountains, the San Miguel River Canyon and its tributaries. In 1997, average daily traffic volumes for this stretch ranged between 3,725 near Placerville and 3,988 closer to Telluride, and reflected the high usage of this section of the byway for daily commuters to the Telluride area. Traffic volumes during peak summer tourist seasons would be expected to be substantially higher. The San Juan Skyway Scenic Byway and the Keystone Overlook Interpretative Pulloff are within the foreground and middleground distance zones of the Norwood-Telluride Alternative viewshed.

The Unaweep-Tabeguache Scenic and Historic Byway. The Unaweep-Tabeguache Scenic and Historic Byway extends from Placerville to Whitewater, along SH 145 and SH 141. This byway provides travelers sightseeing opportunities to view wildlife, geologic and paleontological resources in Unaweep Canyon, as well as the region's rich mining and ranching history. Within the project area, the byway includes portions of SH 145 and SH 141, and extends westward from the intersection of SH 145 and SH 62. Views along this stretch of the byway are primarily of the San Miguel River Canyon, ranching and farming areas of Wrights Mesa, and portions of Naturita Canyon. 1997 traffic volumes along this byway ranged between 1,200 and 3,043 (CDOT 1997). This byway falls within the foreground distance zone of the Nucla-Norwood Northern Alternative. The viewsheds for the Nucla-Norwood Central and Southern Alternatives also encompass small sections of this scenic byway.

Other State Highways. Other state highways are located in the western edge of the project area, including SH 97 and SH 90. These highways are located two to three miles west of the alternatives and are not within view of the alternatives.

Developed Recreation Areas

Developed public and private recreation sites within the project area include the Telluride Ski Area, the Galloping Goose Trail, the Mary E. Day Use Area, the Sheep Corral Campground, and Faraway Ranch. A number of National Forest and public BLM roads and trails are also used for hiking and sightseeing (see ***Plate REC-1).***

Telluride Ski Area. The Telluride Ski Area is located approximately three miles east of the Telluride Substation, and falls within the middleground to background viewing distance zone of the Norwood-Telluride Alternative. The ski area received over 375,000 skier days in 1997-98.

Galloping Goose Trail. The Galloping Goose Trail is used extensively for mountain biking. Within the project area, the trail extends from near the Telluride Substation on Lawson Hill westward before turning south through Ilium Valley. The trail utilizes the old railroad grade for most of this distance. Although annual use figures are not available from the Forest Service, 910 people were recorded using the trail in 1998 during a single summer weekend day (Dunkelberger 1999). The Telluride Trails Council also has plans for expanding the trail west of Ilium Valley along the San Miguel River. The Galloping Goose Trail would serve as an access road along portions of the Norwood-Telluride Alternative, and, as such, falls within the foreground viewing distance zone of this alternative.

Mary E. Day Use Area. The Mary E. Day Use Area is located along the South Fork of the San Miguel River, south of the Ilium Valley Business and Industrial Park and sand and gravel operation. The area has primitive facilities and is used to accommodate overflow camping during the Telluride Bluegrass Festival. No use figures are available for the site. The site falls within the foreground viewing distance zone of the Norwood-Telluride Alternative.

Faraway Ranch. Faraway Ranch is a private recreation facility located on 960 acres of Wilson Mesa. The Ranch offers a wide variety of educational wilderness experiences, seminars and climbing programs for youths and adults. The ranch is crossed by the Norwood-Sunshine Alternative and lies within the foreground viewing distance zone.

Designated Wilderness Areas

Mount Sneffels Wilderness Area. The Mount Sneffels Wilderness Area is comprised of 16,505 acres that were designated as wilderness by Congress in 1980. The Sneffels Range contains more than 15 summits over 13,000 feet, and provides ample opportunities for backpacking, hiking, climbing and ski touring. The southern edge of the wilderness area lies within the middleground to background distance zones of the Norwood-Telluride Alternative, and the background zone of the Norwood-Sunshine Alternative.

Lizard Head Wilderness Area. The Lizard Head Wilderness Area is situated southwest of Telluride and encompasses 41,000 acres of National Forest lands. The eastern part of the wilderness area that encompasses Mount Wilson and nearby peaks is within the middleground viewing distance zone of the Norwood-Sunshine Alternative.

NATIONAL FOREST SYSTEM ROADS, TRAILS AND DISPERSED RECREATION

The project area includes portions of the Uncompahgre National Forest (UNF), primarily at the eastern end, near Telluride. As discussed previously under the Land Use and Recreation Sections (Sections 3.8 and 3.9), the part of the UNF directly crossed by the project alternatives is managed as 2B, for roaded natural and rural recreation opportunities (Forest Plan 1991). Other parts of the UNF, within three miles of the eastern end of the project alternatives, have been designated in the Forest Plan as management emphasis areas 2A (semi-primitive motorized recreation opportunities in a natural appearing environment); 4B (wildlife habitat management for one or more indicator species... semi-primitive non-motorized, semi-primitive motorized, and roaded rural recreation opportunities provided); and 6B (livestock grazing... semi-primitive non-motorized, semi-primitive motorized, and roaded rural recreation opportunities provided).

Southwest of Norwood other sections of the Uncompahgre National Forest are also within 4B and 6B management areas, as well as 7A management areas (Wood fiber production... semi-primitive non-motorized, semi-primitive motorized and roaded rural recreation opportunities provided.) National Forest roads and the public lands are used for a variety of dispersed recreational activities including viewing scenery, photography, hiking, mountain biking, etc. OHV use (motorcycles, ATVs and four-wheel drives) is also a recreational activity on public and National Forest lands.

Specific roads that provide access to the national forest and are considered visually sensitive to changes potentially brought about by the proposed Project include the Last Dollar Road (FS 638; SM T60), Fall Creek Road (SM 57P); Silver Pick Road (SM 60M), Sunshine Mesa Road (SM 63.J), County Road 58P, Specie Mesa Road (SM M44), Bilk Creek Road (SM 62K) South Fork Road (SM 63L) and Lone Cone Road (SM 44.Z). With the exception of the Last Dollar Road and County Road 58P, all of these roads are crossed by the project alternatives and fall within the foreground viewing distance zone. These latter two roads lie approximately one to three miles north of the Norwood-Telluride Alternative and fall within the middleground viewing distance zone.

Hiking trails within, or skirting, the Sneffels Wilderness Area include, among others, the Sneffels Highline Trail (434) and the Deep Creek Trail (418), located on the southfacing slopes of Mt. Sneffels. Located two to three plus miles north of the Norwood-Telluride Alternative, portions of the Highline and Deep Creek Trails fall within the middleground to background distance zone of this alternative. To the south, skirting the edge of the Lizard Head Wilderness Area is the Wilson Mesa Trail (421), which is within two to three miles (middleground distance zone) of the Norwood-Sunshine Alternative.

The Bilk Creek Trail follows the south rim of the San Miguel River Canyon and portions of Wilson Mesa, crossing both private lands and some National Forest lands. This trail connects to the Bilk Creek Bridge and provides access to the river, National Forest and climbing areas along the south rim of the San Miguel River Canyon. The trail falls within the foreground viewing distance zone of the Norwood-Telluride and Norwood-Sunshine Alternatives.

BLM Roads, Trails And Dispersed Recreation

BLM lands considered potentially sensitive to visual changes include lands managed as L1, the San Miguel River Canyon Area of Critical Environmental Concern (ACEC), and C1, the San

Miguel River Canyon Special Recreation Management Area (SRMA). The BLM manages approximately 33,000 acres of public lands within the San Miguel River corridor, from Deep Creek down to Piñon as an SRMA. Approximately 22,000 acres within this area have been specially designated as an ACEC. The ACEC and SRMA are both crossed by, and within, the foreground distance zones of the Norwood-Telluride and Norwood-Sunshine Alternatives.

Other BLM lands considered visually sensitive by local residents include lands associated with Naturita Canyon, west of Norwood. The canyon provides a relatively rare opportunity for natural primitive experiences near Wrights Mesa and is valued by local residents for fishing, hunting, hiking, and solitude qualities. Portions of the canyon fall within the foreground and middleground viewing distance zones of the Nucla-Norwood alternatives (Northern, Central, and Southern). Dispersed recreational activities along the canyon are similar to those discussed above for the Uncompahgre National Forest.

Residential Areas

Plate LAND-1 shows the distribution of residences within one-half mile (foreground viewing distance zone) of the project alternatives. Existing residences within one-half mile of the alternative alignments are primarily concentrated on Wrights Mesa, near Telluride on Lawson Hill and in the Ilium Valley. Dispersed seasonal and year-round residences are found throughout the project area, particularly on Wrights Mesa, Specie Mesa, Wilson Mesa, and Sunshine Mesa. The Town of Redvale is crossed by the Nucla-Norwood Northern Alternative. Several other communities are within the project area three-mile limits, including Nucla, Naturita, Norwood, Placerville, Sawpit, Telluride and Mountain Village.

Future residential viewing locales can also be inferred from the various ranches and subdivision developments currently available for purchase. *Plate LAND-3* shows major ranches and subdivision developments within three miles of the project alternatives. Approximately 25 approved developments and subdivisions are within three miles of the alternative alignments. Given the long-term nature of the proposed Project (50 years plus), these yet to be developed areas are also considered reasonably foreseeable visually sensitive areas.

APPLICABLE VISUAL RESOURCE PLANS, POLICIES, AND GOALS

Policies and goals have been adopted by the Forest Service, BLM and San Miguel County for the protection and enhancement of important scenic resources. This section of the EIS summarizes those policies by jurisdiction.

Forest Service - Uncompahgre National Forest

Visual resource management direction, standards, and guidelines for the Uncompahgre National Forest are outlined in the Forest Plan (1991). The Forest Service has utilized the Visual Management System (VMS) to establish the desirable Visual Quality Objectives (VQOs) for National Forest landscapes. The VMS system takes into consideration landscape character and scenic quality, visual sensitivity and distance zones in determining the appropriate management class for national forest lands (USDA Forest Service 1974). VMS classes may vary from Preservation, Retention, Partial Retention, Modification, or Maximum Modification. Portions of the Uncompahgre National Forest that fall within the alternative corridors have been designated as Retention and Partial Retention VQOs. For parts of the National Forest that lie outside the corridors, but within the three mile project area limits, lands have been designated as Preservation, Retention, Partial Retention, and Modification. These VQOs are shown in *Plate VISUAL-2* and are defined as follows:

- ***Preservation*** - This visual quality objective allows ecological changes only. Management activities, except for very low visual impact recreation facilities, are prohibited. The

Preservation VQO applies to wilderness areas in the project area, including Sneffels Wilderness Area and Lizard Head Wilderness Area.

- ***Retention*** - This visual quality objective provides for management activities that are not visually evident. Under Retention, activities may only repeat form, line, color, and texture which are frequently found in the characteristic landscape. Changes in their qualities of size, amount, intensity, direction, pattern, etc., should not be evident. Within the project area, the Retention VQO has been designated for portions of the Uncompahgre National Forest at the north end of Ilium Valley.
- ***Partial Retention*** - Management activities should remain visually subordinate to the characteristic landscape when managed according to the Partial Retention VQO. Activities may repeat form, line, color, or texture common to the characteristic landscape but changes in their qualities of size, amount, intensity, direction, pattern, etc., remain visually subordinate to the characteristic landscape. Partial Retention landscapes are found within the Ilium Valley and south of Mountain Village.
- ***Modification*** - Under the Modification VQO, activities may visually dominate the original characteristic landscape. However, activities of vegetative and landform alteration must borrow from naturally established form, line, color, or texture so completely and at such a scale that its visual characteristics are those of natural occurrences within the surrounding area or character type. Modification Class VQOs are found north of Little Cone, on the outlying fringes of Lizard Head and Mount Sneffels Wilderness Areas, and on portions of the Uncompahgre National Forest, south and southwest of Norwood.

In addition to the VQO Classes, the Forest Plan contains Management Prescription 1D that specifically addresses visual guidelines for transmission corridors. This prescription provides general direction that transmission corridors are to be designed and constructed to harmonize with the landscape (Forest Plan 1991). Management Prescription 2B also contains specific direction regarding visual resources:

> *'Visual resources are managed so that management activities maintain or improve the quality of recreation opportunities. Management activities are not evident, remain visually subordinate, or may be dominant, but harmonize and blend with the natural setting. Landscape rehabilitation is used to restore landscapes to a desirable visual quality... Scenic Byways will be a special emphasis, within this prescription... The primary objective will be to showcase outstanding National Forest scenery and increase pubic awareness and understanding of National Forest activities.' (Forest Plan 1991)*

Bureau of Land Management

Nationwide, the BLM has adopted the Visual Resource Management (VRM) system for identifying and managing lands for visual or scenic values. Four classes of landscapes are considered with varying objectives for development within those classes. Similar to the VMS system, the VRM system takes into consideration landscape character and scenic quality, visual sensitivity and distance zones in determining the appropriate management class for public BLM lands. The most restrictive is Class I, where the objective is to preserve the existing landscape. Any change to the character should be very low and not attract attention. The least restrictive is Class IV, where the objective is to provide for management activities that necessitate major modification of the landscape (USDI, BLM 1984). Within the project area, public BLM lands have been classified as VRM Class II and Class III in the Resource Management Plan (RMP 1984). These classes are defined as follows:

VRM Class II - Changes in any of the basic elements (line, form, color, texture) caused by a management activity should not be evident in the characteristic landscape. Contrasts are seen, but must not attract attention. Within the project area, BLM lands within the San Miguel River Canyon ACEC have been designated as Class II. In addition, lands within the SMRA are

managed by BLM as Class II (Pfifer 1999: pers. comm.) in order to protect the scenic values of the San Juan Scenic Byway.

VRM Class III - Contrasts to the basic elements caused by a management activity are evident, but should remain subordinate to the existing landscape. Class III lands are found in the western half of the project area.

Montrose County

Montrose County does not have any adopted plans or policies that address visual or scenic issues for this part of the county.

San Miguel County

San Miguel County has a number of adopted goals and objectives in the County's Comprehensive Development Plan (CDP 1998) that address visual and scenic resource issues. The following pertain to visual issues by planning area:

- ***Wrights Mesa***

  3.3 *Preserve agricultural character and rural and historical features by minimizing the visual impacts of development.* Objective (1) encourages locating new development in areas where visual impacts can be mitigated with trees or other vegetation. Objective (2) is to consider the impact of development along State Highway 145 and county roads with regard to scenic view plains *[sic]*.

- ***Telluride Regional Area***

  (C) Scenic Quality. Goal: Preserve and enhance the scenic quality along State Highway 145 for the benefit of residents and the continued viability of the regional area's recreation-based economy, which is primarily dependent upon the quality of the physical setting. Objectives include: 1) promoting the aesthetic improvement and positive visual images of existing developments along State Highway 145 and guiding the location of new development so that detrimental impacts upon visual quality are minimized; 2) establishing a scenic foreground along the State Highway 145 within the Telluride Regional Area and steering development away from the foreground; 3) Preserving outstanding scenic vistas which draw people to Telluride, such as the view of the valley floor from the lower airport road (Last Dollar Road); and 10) encouraging the undergrounding of powerlines, which will serve future development.

- ***Remainder of the County***

  Objectives include: (2) preserving valuable natural resources, including physical attributes such as scenic vistas, as well as economically valuable resource deposits.

In addition to the CDP planning area goals and objectives, San Miguel County has a policy to try and locate public utilities and utility lines on lands that create the least amount of impact on the residents of the County and the natural environment. The county has a land classification system that addresses priority lands and their suitability for locating utilities and utility lines. Class 3 Priority lands are defined to include 'skylines visible from major transportation routes...' (CDP 1998).

3.10.2 ENVIRONMENTAL CONSEQUENCES

3.10.2.1 ANALYTICAL FRAMEWORK

POTENTIAL TYPES OF IMPACTS

The proposed Project would affect the visual environment by introducing facilities (*e.g.*, poles, conductors, insulators, and substation components) and landscape modifications (*i.e.*, grading at substation sites and access roads) that would contrast with the existing landscapes to varying degrees. The degree of visual change caused by a proposed action is typically measured in terms of how much the new facilities and access roads would contrast with the surrounding landscape character, based upon changes in visual elements of line, form, color, and texture. A number of interrelated variables ultimately affect the degree of visibility and visual contrast that powerlines and substation facilities may create. Such factors include, among others, the scale and size of the proposed poles in relation to other cultural features, the color and texture of facility materials and access roads, sun angle and the reflectivity of the conductors and insulators, view orientation and distance, and the influences of adjacent scenery or land uses. The degree to which the Project would be seen by potentially sensitive viewers and the visual absorption capability (VAC) of the landscape to screen or conceal project features are also important considerations in assessing potential visual effects.

Field reconnaissance studies were conducted to determine the outer limits of measurable visual effects in the project area, and to assess the variables that would cause visual impacts in the different landscape character types and viewing distance zones. The potential outer distance from which the Project could be noticeably visible and draw attention was determined to be in the range of three miles, although in specific situations where long views of right-of-way clearings or skylining of poles on ridges could occur, this distance could extend up to four plus miles.

For the purposes of this EIS, computer-generated viewsheds were delineated for lands within three miles of each of the alternatives to define the hypothetical worst-case impact areas. The viewsheds of the various alternatives were generated using the ARC INFO program and are shown in ***Plate VISUAL-3***. These viewsheds are based upon terrain parameters only and do not take into consideration the effect that intervening vegetation (*e.g.*, conifer forests, pinyon-juniper, local landscaping) or structures (*e.g.*, houses, barns, etc.) may have in limiting visibility conditions from any given viewpoint.

The field studies concluded that the degree to which the project features would be visible and draw attention would vary by distance zone and landscape character type. Within the immediate foreground distance zone (within 0.5 mile) poles, hardware and conductors would be clearly visible. The degree to which these features would contrast with the existing visual environment would depend upon whether there were other features, similar in line, form (*e.g.*, scale), color and texture that were seen. In landscapes with strong cultural influences, one-half mile was determined to be the distance zone in which the poles could noticeably draw viewer attention due to increased height in comparison to other surrounding features. Beyond this distance, poles would to be viewed in scale with other closer cultural features. In natural landscape character types, the degree to which the scale of the poles would be noticeable was found to primarily depend upon vegetation type. In areas with similar height conifers, poles would typically be perceived as being in scale. In areas such as open meadows and aspen groves, the height of the poles could remain dominant beyond the half-mile foreground distance zone. ***Figure 3.10-1*** is photographs of typical viewing conditions within the foreground distance zone.

Existing 115 kV Single Pole (Same Design as Proposed Project)

Existing 115 kV Transmission Poles and Conductors – With Distribution Underbuilt (Slightly Different Design Than Proposed Project)

Typical Visibility of a 115 kV Transmission Line within a Foreground Viewing Distance Zone

Figure 3.10-1

Within the middleground viewing distance zone (0.5 to 3.0 miles), the horizontal lines created by the conductors would become the most visually evident feature of the Project, particularly in low sun angle conditions of early morning and late afternoon (see ***Figure 3.10-2***). Although Tri-State has committed to using non-specular conductors, which would substantially reduce the visibility of lines during the main part of the day, field studies concluded that within one to three miles the conductors may draw attention, depending upon specific lighting conditions and sun angle. The degree of contrast of the conductors' horizontal lines would also be strongly influenced by whether the conductors were viewed against a light sky or dark green forest background and whether other similar horizontal lines were present in the view. The presence or absence of similar linear features, such as other transmission lines and distribution lines, was determined to substantially affect the degree to which the proposed 115 kV conductors would become strong visual elements from the middleground viewing distance. Beyond the middleground distance zone, the visibility of the Project would largely be diminished except in instances where long views of the right-of-way clearing and/or skylining of poles occurs. Background distance zones (beyond 3.0 miles) from designated wilderness areas were considered in assessing these potential conditions.

In order to evaluate the range of visual impacts that would result from the various alternatives, a number of key observation points (KOPs) were evaluated in detail. KOPs were selected to show the range of effects that may occur at different distance zones and within the various landscape character types. ***Plate VISUAL-4*** shows the location of the KOPs and *Table 3.10-1* summarizes the KOPs by use, distance zone, sensitivity level, and landscape character type.

Computer-generated visual simulations were prepared for selected alternatives and KOPs. Photo-realistic and accurate simulations of the project alternatives were generated using AutoCAD, LandCADD Site Analysis, and Hi-Res QFX programs. Principles and techniques used for the simulations were consistent with *Visual Simulation – A User's Guide* (Sheppard 1989). The simulations served as the basis for evaluating future visual changes in the landscape brought about by the project alternatives. The detail and appearance of the simulations were based upon project description criteria provided by Tri-State and San Miguel Power Association (Chapter 2.0).

The anticipated visual impacts of the alternatives were assessed in the field, using the visual simulations and evaluation criteria that are based upon the Forest Service VMS and BLM VRM systems. Evaluation forms were used to document the following pertinent factors:

- Landscape character type, distance zone and sensitivity level associated with the KOP.
- The *Visual Absorption Capability* (VAC) of the landscape to visually screen or camouflage the project elements that would be viewed from the KOP. Variables assessed included topographic screening, slopes, vegetation screening and patterns, soil/vegetation colors, and site recoverability potential. Three levels of VAC were used – high, moderate, and low. The high rating reflects good, or suitable, site characteristics, and low VAC reflects poor site suitability.
- The *Visual Contrast of the Project* based upon the degree of change in line, form, color, and texture that the project elements would create in conjunction with the existing environment. Three levels of contrast were considered – weak, moderate, and strong. Weak suggests minor or low visual contrast with the surrounding landscape, while strong contrasts suggest the facilities would be visually evident or dominate a setting.
- The *Compliance of the Project with Federal, State, and Local Policies and Guidelines for Visual Resources*. Whether the Project would meet the Forest Service's established VQOs or other BLM or county plans and policies for visual resource management were considered.

The findings of the KOP impact assessments are on file at the Forest Service's office, and were used in conjunction with field reconnaissance to estimate the maximum level of impact that would be expected along each segment of the alternatives. Due to the number and distribution of homes within the project area, impacts to residential viewers were typically documented within one-half mile (foreground distance zone) of the alternative alignments and were field verified, since this would usually represent the worst-case condition. Visual impact estimates for residents within the middleground distance zone (0.5 to 3.0 mile) were based on limited field reconnaissance and review of the 1997 aerial photographs. Impacts to scenic byways and recreation areas within the foreground and middleground distance zones were evaluated in the field, where access was available.

Definition of Impact Levels

Impact levels are defined as follows in this assessment of visual effects:

High Impacts - High visual impacts are identified where:

- The project facilities would be located within a foreground distance zone of sensitive viewers and would result in strong contrasts due to both the proximity and visibility of project features including poles, hardware, and conductors, and the lack of similar cultural features. High impact landscapes typically have a low VAC.
- The project facilities would be located within a middleground distance zone of sensitive viewers and would potentially result in strong contrasts due to either the scale of the poles and/or the horizontal lines created by the conductors. High impacts are assessed in landscapes with little to no cultural influences with similar line and form elements.
- The project facilities would be located within a middleground or background distance zone of sensitive viewers and would potentially result in strong contrasts in landscapes with low VAC due to the right-of-way clearing, access roads, or skylining of poles on ridgelines.
- The project facilities would not meet the visual resource goals, policies and objectives of federal, state and local agencies.
- The project facilities would cause strong contrasts in natural canyon landscapes due to the potential requirement for orange, white and yellow marker balls. This potential requirement of FAA or local agencies may apply to canyon crossings where the line would be 200 feet or more above the ground.

Moderate Impacts - Moderate visual impacts are identified where:

- The project facilities would be located within a foreground distance zone of sensitive viewers and would result in moderate contrasts due to the proximity and visibility of project features including poles, hardware, and conductors, that would be viewed in conjunction with other cultural features of similar scale, line, form and color.
- The project facilities would be located within a middleground to background distance zone of sensitive viewers and would potentially result in moderate contrasts due to the horizontal lines created by the conductors. Moderate impacts are assessed in landscape settings containing some cultural features with similar horizontal line elements.
- The project facilities would be located within a middleground or background distance zone of sensitive viewers and would potentially result in moderate contrasts in line, form and/or color due to right-of-way clearings, access roads and pole skylining on ridgelines. Landscapes where moderate impacts are identified are characterized by moderate VAC.

Existing 69 kV Transmission Line (0.5+ mile distance)

Existing Distribution Lines (0.5+ mile distance) and High Voltage Power Lines (2.0 miles)

Typical Visibility of Transmission Line Conductors within a Middleground Viewing Distance Zone

Figure 3.10-2

Low Impacts – Low impacts are assessed where:

- The project facilities would be located within a foreground distance zone of sensitive viewers and would result in little to no contrasts due to the proximity of other industrial features of greater scale, form and contrast.
- The project facilities would be located within a middleground to background distance zone of sensitive viewers but would potentially result in no or little contrasts due to the high VAC of the landscape and/or the presence of numerous cultural modifications with similar horizontal line elements.
- The Project would affect landscapes where sensitive viewers are not present.

APPLICABLE PERMITS, STANDARDS AND ORDINANCES

The counties, BLM and Forest Service may consider visual resource issues in their determinations of whether to issue Special Use Permits and Right-of-Way Grants for the Project. No other specific permits or authorizations are required for visual resources.

ENVIRONMENTAL PROTECTION MEASURES

In order to reduce potential visual effects, Tri-State has defined a number of standard mitigation measures, listed in *Table 2.2-4*, including measures numbered 2, 3, 5, 6, 20, 22, 29, 31, 32. Additional requirements on federal lands that would help minimize visual effects are shown in *Table 2.2-5* and include numbers 8, 28 and 31. Additional site specific mitigation measures may be imposed which will be incorporated into the CO&M Plan.

3.10.2.2 IMPACTS OF THE PRIMARY TRANSMISSION ALTERNATIVES

The visual effects of the primary alternatives are described below and are supported by visual simulations of the various alternatives from the KOPs (***Plates VISUAL-5*** through ***VISUAL-18***). LandCADD models were generated to place and accurately scale the project facilities. Specific simulations that should be referenced for each alternative are noted at the front of the alternatives discussions. *Tables 3.10-2* and *3.10-3* summarize the impact findings of the primary system alternatives.

Nucla-Norwood Northern Alternative

*Reference: KOP A, **Plate VISUAL-5***

115 kV TRANSMISSION LINE EFFECTS

Landscape Impacts. The 115 kV transmission line would primarily cross through agricultural and ranching lands (6.5 miles) that contain numerous cultural modifications, including fences, distribution lines, barns, agricultural and ranching buildings and homes. The visual quality of these settings are typically open, pastoral, and of visual interest due to natural beauty and ranching history. Within this landscape character type, the proposed single-pole 115 kV wood pole transmission facility would generally create moderate to low contrasts in line, color and texture, and would generally repeat the visual elements currently perceived as part of the landscape character. Beyond the foreground distance zone, the poles would typically blend in scale with other visible cultural features such as fences and distribution lines. Within the middleground distance zone, the conductors may be openly visible across the agricultural fields, and could create moderate line contrasts, particularly in low light conditions. However, since this alternative entails rebuilding the existing 69 kV line in its current location, the

increased contrast in line created by the larger conductors would be incremental and weak in overall degree of change.

Other landscape character types crossed by this alternative include predominantly natural landscapes of the Colorado Plateau, principally found south of the Nucla Substation and along the northern and eastern edge of Naturita creek and canyon. These landscapes are characterized by homogeneous pinyon-juniper vegetation cover that creates a green-grey texture against exposed tan-colored soil slopes. Landscape impacts associated with upgrading the 69 kV line to 115 kV through these areas are assessed as low to moderate, due to the moderate VAC of the landscape and the weak changes in line contrasts between the existing 69 kV line and the proposed 115 kV system.

Table 3.10-2
Summary of Visual Impacts for Nucla-Norwood Primary Alternatives

Visual Resource/Issue	Nucla-Norwood Alternatives		
	Northern	Central	Southern
General Landscape Types and Visual Absorption Capability (VAC)			
Uncompahgre Plateau – Agricultural landscapes (Moderate to High VAC depending on types of cultural modifications)	Total: 6.5 miles – Moderate Impact San Miguel County – 1.5 miles Montrose County – 5.0 miles	Total: 2.5 miles – Moderate Impact San Miguel County – 1.5 miles Montrose County – 1.0 mile	Total: 0.1 mile – Moderate Impact San Miguel County – 0.1 mile
Uncompahgre Plateau – San Miguel River Tributary Canyons (Naturita Canyon crossing – Low VAC)	0 crossing	1 crossing: Naturita Canyon Moderate to High Impact – 0.5 mile	1 crossing: Naturita Canyon High Impact – 0.5 mile
Uncompahgre Plateau – Flat to Rolling pinyon–juniper shrub landscapes (Moderate to Low VAC)	Total: 10 miles – Moderate to Low Impact	Total: 17 miles – Moderate to Low Impact	Total: 17.6 miles – Moderate to Low Impact
Sensitive Viewer Impacts			
Potential Scenic Byway Impacts – Unaweep–Tabeguache Scenic and Historic Byway (SH 141 and SH 145)			
Approximate number of viewing miles within FG distance zone and driving time affected	17 miles: 18 to 20 minutes viewing time – Moderate Impact	6.5 miles: 7 to 8 minutes of viewing time – Moderate Impact	0.6 mile: less than one minute – Low Impact
Visual Impacts to Public BLM Lands and Recreation Areas			
BLM Lands Impacted – VRM Class II Lands	0 miles – No identifiable effects	0 miles – No identifiable effects	0 miles – No identifiable effects
– VRM Class III Lands	1.5 miles – Low Impact	4.2 miles – Low Impact	8.5 miles – Low Impact
Naturita Canyon – Dispersed Recreation Area	Follows canyon rim on developed edge – Low Impact	Crosses and follows canyon rim on developed edge – Moderate to High Impact	Crosses canyon through natural area; marker balls likely – High Impact
Potential Visual Impacts to Existing Residential Areas			
Viewers within FG distance zone	166 – Moderate to High Impact	101 – Moderate to High Impact	45 – Moderate to High Impact
Viewers within MG distance zone	Low to Moderate Impact	Low to Moderate Impact	18 – Moderate to High Impact
Potential Visual Impacts to Approved Residential Subdivisions			
Lots within FG distance zone	Moderate	Moderate	Moderate
Lots within MG distance zone	Low	Low	Low to High

Table 3.10-3 **Summary of Visual Impacts by Issue for Norwood- Sunshine/Telluride Primary Alternatives**		
Visual Resource/Issue	**Norwood-Sunshine Alternative**	**Norwood-Telluride Alternative**
General Landscape Types and Visual Absorption Capability (VAC)		
Uncompahgre Plateau – Agriculture, open meadows, pastures (High to Low VAC depending upon types of cultural modifications) *(miles affected)*	Total: 11.3 miles – Moderate to High Impacts Irrigated Agricultural Lands – 0.8 mile	Total: 7.4 miles – Moderate to High Impacts Irrigated Agricultural Lands – 0.8 mile
Uncompahgre Plateau – San Miguel River and Tributary Canyons impacted (Low VAC)	0.4 mile: 5 Crossings – Beaver Cr., Saltado Cr., Fall Cr., Big Bear Cr., Bilk Cr. – High Impacts	10.9 miles: 4 Crossings – Beaver Cr., Saltado Cr., Fall Cr., Big Bear Cr. And the San Miguel River Canyon – High Impacts
Uncompahgre Plateau – Flat to Rolling pinyon–juniper shrub landscapes (Moderate to Low VAC)	9.5 miles – Moderate to Low Impacts	9.5 miles – Moderate to Low Impacts
Uncompahgre Plateau/San Juan Mountains – conifer forests impacted (Low to Moderate VAC) *(miles affected)*	1.9 miles – Moderate to High Impact	8 miles – Moderate to High Impact
Uncompahgre Plateau/San Juan Mountains – aspen groves impacted (Low to Moderate VAC) *(miles affected)*	2.0 miles – Moderate to High Impact	2.5 miles – Moderate to High Impact
Uncompahgre Plateau/San Juan Mountains – High Mesas with Adjacent Mountain Scenery Influences	16.6 miles – Moderate to High Impact	8.3 miles – Moderate to High Impacts
Uncompahgre Plateau/San Juan Mountains – Visually prominent ridge lines crossed (Alignment crossing and viewing location)	East facing canyon slope of Ilium Valley – from South Fork Road (63.L) – Moderate Impact	Bear Creek Canyon – from SH 145 and Last Dollar Road (T60) – High Impact San Miguel River Canyon – from SH 145 and Last Dollar Road (T60) – High Impact Fall Creek – from P58 Road – High Impact
Sensitive Viewer Impacts		
Potential Scenic Byway Impacts – San Juan Skyway National Scenic Byway (SH 145)		
Approximate number of viewing miles within 0.5 mile of alignment and driving time affected	0 miles – No Identifiable Effects	5 miles – High Impact
Visual Impacts to Uncompahgre National Forest and Recreation Areas		
National Forest Lands Impacted – Retention VQO	0 miles – not applicable	0.7 mile – Not in Conformity with VQO Class
– Partial Retention VQO	1.1 miles – In Conformity with VQO Class	0 miles – not applicable
Mount Sneffels Wilderness	Low Impact	Moderate Impact
Lizard Head Wilderness	Low Impact	No Identifiable Effects
Telluride Ski Area	Low Impact	High Impact
Galloping Goose Trail	Low Impact	Low Impact
Deep Creek Trail	No Identifiable Effect	Moderate Impact
Wilson Mesa Trail	Low Impact	No Identifiable Effects
Last Dollar Road	No Identifiable Effect	High Impact
Mary E. Day Use Area	No Identifiable Effect	Moderate Impact

Table 3.10-3
Summary of Visual Impacts by Issue for Norwood- Sunshine/Telluride Primary Alternatives

Visual Resource/Issue	Norwood-Sunshine Alternative	Norwood-Telluride Alternative
Visual Impacts to Public BLM Lands and Recreation Areas		
BLM Lands Impacted – VRM Class II	1.1 miles – Not in conformity due to potential marker balls; Within BLM utility corridor.	1.1 miles – Not in conformity due to potential marker balls; Within BLM utility corridor.
– VRM Class III Managed as Class II	0 miles – not applicable	5.2 miles – Not in conformity with current BLM management objectives
San Miguel River Canyon ACEC	1.0 mile – Moderate Impact	1.0 miles – Moderate Impact
San Miguel River Canyon SRMA	0.01 mile – Low Impact	5.3 miles – High Impact
Potential Visual Impacts to Existing Residential Areas		
Viewers within FG distance zone	92 – Moderate to High Impacts	81 – Moderate to High Impacts
Viewers within MG distance zone	High to Low Impacts	High to Low Impacts
Potential Visual Impacts to Approved Residential Developments		
Lots within FG distance zone	Moderate to High Impacts	Moderate to High Impacts
Lots within MG distance zone	Moderate Impacts	Moderate Impacts
Other Potential Visual Impacts to County Roads and Private Recreation Areas		
Fall Creek Road (57.P)	Low Impact	Low Impact
Silver Pick Road (60.M)	Low Impact	Low Impact
Sunshine Mesa Road (63.J)	Low Impact	Low Impact
Specie Mesa Road (M44)	Moderate Impact	Moderate Impact
Bilk Creek Road/Trail (62.K)	Moderate Impact	Moderate to High Impact
County Road P58	No Identifiable Effect	High Impact
Faraway Ranch	High Impact	No Identifiable Effect

Sensitive Viewer Impacts. Sensitive viewers potentially affected by this alternative include residents and travelers along local roadways and the Unaweep-Tabeguache Scenic and Historic Byway (SH 141 and SH 145). Recreationists in Naturita Canyon may also be affected. Approximately 166 residences are within the foreground distance zone of this alternative, where the scale of the poles and hardware may create moderate to high contrasts in line, form and scale. Residential viewers are located in the community of Redvale, on the southern and western edge of Norwood, within the Norwood Garden Estates, Pioneer Village and Timberline View Subdivisions and dispersed in the open agricultural and ranching areas. Beyond this distance zone, impacts are assessed as low to moderate due to the presence of other similar visual elements (fences, distribution lines, etc.) that would minimize the degree of visual contrast created by the Project.

With respect to the scenic byway, the line and poles could create moderate degrees of contrast in line and form elements, where the Project would be viewed within the foreground distance zone – approximately 17 road miles. Views could be affected for 18 to 20 minutes of driving time. Moderate impacts would also be expected along these areas, due to the incremental change of converting the 69 kV line to 115 kV and the similarity of other cultural features viewed.

Regarding visual impacts to users of Naturita Canyon, the line would not be seen from the canyon floor and most accessible areas of the canyon. Northbound travelers on County Road AA.42 would see the line from elevated points along the road leading towards the canyon floor. Contrasts are assessed as weak, however, since the Project would be within the middleground distance zone and viewed against an agricultural setting with many similar visual elements as the proposed transmission line. Although a long view of the project poles and conductors would occur from County Road AA.42, the poles and conductors would appear similar to, and only incrementally larger than, the existing 69 kV line at this middle-

ground viewing distance. *Plate VISUAL-5* shows a computer-generated simulation from this location. Impacts to the canyon are assessed as low due to the weak degree of contrasts the Project would cause, as well as the limited viewing opportunities.

Conformity of Plans and Policies. The Nucla-Norwood Northern Alternative crosses public BLM lands that have been designated as VRM Class III for 1.5 miles. The degree of visual change (weak to moderate) brought about by the Project would be consistent with this class. Five miles of agriculture are crossed in Montrose County, where there are no adopted plans or policies regarding this part of the county. With respect to San Miguel County, this alternative would cross open agriculture and meadow landscapes for 1.5 miles. These lands are considered Priority Class 3 by San Miguel County for locating new utilities and are evaluated further in Section 3.8, Land Use. The Nucla-Norwood Northern Alternative would also be inconsistent with the county's objective for Wrights Mesa (objective 3.3), to minimize visual impacts of development in agricultural areas and along SH 145. Due to the proximity of the Project to SH 145 and through open agricultural lands, this alternative offers few opportunities for mitigating visual impacts with vegetation screening and would further affect views from SH 145.

Substation Effects

Equipment modifications at the Nucla Substation would have no identifiable effect on visual resources due to the current industrial character of the site and the lack of sensitive viewers and landscapes.

Expansion of the Norwood Substation would noticeably increase the scale and industrial character of the existing substation site. Strong contrasts in form and scale would primarily be created by the grey steel switchracks, which would be approximately twice as tall as the existing substation equipment. The substation would be viewed from both foreground and middleground distance zones, primarily by local residents living north of the site. Approximately 45 rural residences are within one mile of the substation, as well as residents of the Town of Norwood. Potential impacts to these types of sensitive viewers is assessed as moderate, since the substation could noticeably exceed the scale of most surrounding cultural features. An existing communication tower, located to the east of the existing site, is the only feature of similar scale and character.

The expansion of the Norwood Substation would not conflict with any visual guidelines or policies of San Miguel County.

69 kV Transmission Line and Distribution System Effects

The visual effects of upgrading the 69 kV line to 115 kV are reported above under the discussion of the transmission line effects. The underbuilding of distribution lines on the 115 kV poles would increase the degree of contrast in line elements over those reported for the 115 kV. Moderate to strong contrasts in line would be expected to result to adjacent residences located in Redvale (Link 1, mile markers 7.0 to 7.5), and near Norwood (Link 2, mile markers 3.0 to 4.0).

Nucla-Norwood Central Alternative

*Reference KOP A, **Plate VISUAL-5***

115 kV Transmission Line Effects

Landscape Impacts. The 115 kV transmission line would primarily cross flat to rolling landscapes of the Colorado Plateau characterized by pinyon-juniper and shrub vegetation cover (17 miles) and agricultural and ranching lands (2.5 miles) that contain numerous cultural modifications,

including fences, distribution lines, barns, agricultural and ranching buildings and homes. The visual quality of the natural pinyon-juniper and shrub covered landscapes is characterized by homogeneous grey-green colors and mottled textures set against exposed tan soils. These areas are common within the region, and typically support slow growing trees that reach 15 to 20 feet in height. Within the pinyon-juniper landscape character type, the proposed single-pole 115 kV wood pole transmission facility would generally create moderate to low contrasts in line, color and texture, since the line would parallel an existing 115 kV line or replace the 69 kV line for most of its distance, thereby generally repeating the visual elements currently created by cultural modifications. No clearing of vegetation from the right-of-way would occur due to the low tree cover. Naturita Canyon would be crossed at Link 5, mile marker 4.6 to 5.1. This crossing would be visible to travelers and recreationists along 1135 Road. Visual impacts would range from moderate to high depending on viewer attitudes and whether color marker balls are installed. Overall, the canyon setting is natural, except for mining activity on the east rim. The northern edge of Naturita Canyon would then be followed for approximately 3.5 miles, where the line and poles would be adjacent to both agricultural lands and the steep slopes of the canyon. Impacts to the canyon in these areas are anticipated to be low, since the line and poles would be difficult or impossible to see from the canyon floor (see sensitive viewer discussion below). In rare instances where the Project might be seen, only small sections of the Project would be visible viewed against background agricultural landscape improvements (see ***Plate VISUAL-5***).

The agricultural settings are typically open, pastoral, and of visual interest due to the natural beauty and ranching history. Beyond the foreground distance zone, transmission line poles would blend in scale with other visible cultural features, such as fences and distribution lines.

Sensitive Viewer Impacts. Sensitive viewers potentially affected by this alternative include residents and travelers along local roadways and the Unaweep-Tabeguache Scenic and Historic Byway. Persons engaged in dispersed recreation activities in Naturita Canyon may also be affected. Approximately 101 rural residences are within the foreground distance zone of this alternative. The majority of these viewers are situated in rural agricultural landscapes, west and south of Norwood, and in the Norwood Garden Estates, Pioneer Village and Timberline View Subdivision. In these settings the scale of the poles and hardware may create moderate to high contrasts in line, form and scale. Beyond the foreground distance zone, impacts are assessed as low to moderate due to the presence of other similar visual elements (fences, distribution lines, etc.) that would be viewed as well.

With respect to the scenic byway, the Project would be viewed at distances ranging from 0.4 to 0.6 mile away, for approximately 6.5 road miles. Views could be affected for 7 to 8 minutes of driving time. Moderate to low impacts would also be expected along these areas due to the viewing distance and the weak to moderate visual contrasts associated with converting the 69 kV line to 115 kV within this agricultural landscape.

Impacts to recreational users of Naturita Canyon would be similar as described above for the Nucla-Norwood Northern Alternative. The line would be slightly closer to the north rim of Naturita Canyon. Views of the canyon crossing would occur from 1135 Road, southeast of Redvale. Similar to the Nucla-Norwood Northern Alternative, long views of the poles and line would also be possible from elevated viewing locations on County Road AA.42, however, from these middleground viewing distances, the poles and line would be viewed in scale with background agricultural developments. In addition, few opportunities for seeing any of the line and poles from the canyon floor would occur. See discussion above and ***Plate VISUAL-5***.

Conformity of Plans and Policies. The Nucla-Norwood Central Alternative crosses public BLM lands for 4.2 miles that have been designated as VRM Class III. The degree of visual change (weak to moderate) brought about by the Project would be allowable within this class. Montrose County has no adopted plans or policies regarding this part of the county. With respect to San

Miguel County, this alternative would pose similar conflicts with the County's goals and objectives for Wrights Mesa as described above for the Nucla-Norwood Northern Alternative.

Substation Effects

Visual changes associated with planned improvements at the Nucla Substation and Norwood Substation would be the same as reported above for the Nucla-Norwood Northern Alternative.

69 kV Transmission Line and Distribution System Effects

The visual effects of removing the existing 69 kV line along Link 1 would be beneficial. Due to the small scale of this existing line, its removal would cause slight improvements in the visual setting of sensitive views within a foreground distance zone. The underbuilding of distribution lines on the 115 kV poles near Norwood (Link 2 mile markers 2.6 to 3.1) would increase the degree of contrast over those reported for the 115 kV. Moderate to strong contrasts in line would be expected to result to nearby residences located within 0.5 mile of the line near Norwood.

SMPA has also suggested removing 1.8 miles of distribution line between the Nucla Substation and SR 145 instead of the 69 kV line. This change would result in similar beneficial effects as removing the 69 kV line, since both lines are similar in height and scale.

Nucla-Norwood Southern Alternative

Reference KOP B, ***Plate VISUAL-6***

115 kV Transmission Line Effects

Landscape Impacts. The 115 kV transmission line would cross flat to rolling sections of the Colorado Plateau characterized by pinyon-juniper shrub/grassland vegetation cover (17.6 miles), steep canyons (0.5 mile) and agricultural lands (0.1 mile) that contain numerous cultural modifications. The Southern Alternative would also cross a central part of Naturita Canyon that is valued locally by residents for its visual qualities and opportunities for wildlife viewing, hiking and solitude experiences.

The visual quality of the pinyon-juniper and shrub/grassland canyon and mesa landscapes is characterized by homogeneous grey-green and tan colors and mottled textures set against exposed soils. These areas are common within the region, and the pinyon-juniper habitat typically supports slow growing trees that reach 15 to 20 feet in height. Within the pinyon-juniper landscape character type, the proposed single-pole 115 kV wood pole transmission facility would create contrasts in line, color and texture ranging in intensity from weak to strong. Low contrasts would occur where the line parallels the existing Nucla-Cahone 115 kV line (Link 4, mile markers 0.0 to 5.9). Moderate to strong contrasts in line and form would occur where the line would establish a new utility corridor and widen existing seismic exploration disturbances for access roads (Link 4, mile markers 5.9 to 7.0 and Link 6, mile markers 0.0 to 9.1). No clearing of vegetation from the right-of-way would be necessary due to the low tree cover. Naturita Canyon would be crossed along Link 6, at mile markers 9.3 to 9.8. This section of the canyon is characterized by deep canyon walls supporting dense pinyon-juniper vegetation and riparian vegetation along Naturita Creek. No existing cultural disturbances are visibly evident. Visual contrasts to this section of the canyon would be strong, due to the introduction of poles, conductors and orange, white and yellow marker balls that may be required. Impacts to the natural setting of the canyon would be high, particularly

when viewed within a middleground distance zone, where long views of the conductors and marker balls would occur (see ***Plate VISUAL-6***).

The agricultural settings affected by this alternative are primarily open, pastoral, and of visual interest due to the natural beauty and ranching activities. Within the foreground distance zone, moderate contrasts in pole form and scale would occur. Beyond this distance, the poles would blend in scale with other visible cultural features, such as fences and distribution lines.

Sensitive Viewer Impacts. Sensitive viewers potentially affected by this alternative include residents and travelers along local roadways and the Unaweep-Tabeguache Scenic and Historic Byway. Recreationists in Naturita Canyon will also be affected. Approximately 45 rural residences are within the foreground distance zone of this alternative. The majority of these viewers are within agricultural settings near the Norwood Substation or in the La Mesa Subdivision to the west. Moderate visual impacts would occur to these residences with foreground distance views.

Up to 18 homes within foreground and middleground distance zones of the Project may have views of Naturita Canyon. This section of the canyon is currently in a natural condition with few to no cultural influences. These residences would incur high visual impacts where open, long views to the line, conductors and marker balls would result. Strong contrasts in line, form, and color would result and long views of the line would be possible from some residences (see ***Plate VISUAL-6***). Moderate impacts would occur where intervening vegetation or structures restrict visibility conditions.

With respect to the scenic byway, the line and poles could create weak to moderate degrees of contrast in line and form elements, where the Project is viewed at distances ranging from 0.4 to 0.6 mile, for approximately one-half road mile. Views would be affected for less than one minute of driving time. Low impacts would also be expected along these areas, due to the short duration of view and the similarity of other cultural features viewed.

Regarding the potential visual impacts to recreational users of Naturita Canyon, the line may be visible within the canyon in the immediate vicinity of where the line and marker balls would pass overhead. Contrasts would be high.

Conformity of Plans and Policies. The Nucla-Norwood Southern Alternative crosses public BLM lands for 8.5 miles that have been designated as VRM Class III. The degree of visual change (weak to moderate) brought about by the Project would be allowable with this class. Montrose County has no adopted plans or policies regarding this part of the county. With respect to San Miguel County, this alternative would cross open agriculture and meadow landscapes for 0.1 mile. These lands are considered Priority Class 3 by the county for locating new utilities and are evaluated further in Section 3.8, Land Use. In general, however, this alternative would not conflict with San Miguel County's goals for Wrights Mesa, since the line would avoid most scenic-related impacts to agricultural areas and to SH 145.

Substation Effects

Visual changes associated with planned improvements at the Nucla Substation and Norwood Substation would be the same as reported above for the Nucla-Norwood Northern Alternative.

69 kV Transmission Line and Distribution System Effects

The visual effects of removing the existing 69 kV line along Link 1 would be beneficial. Due to the small scale of this existing line, its removal would cause slight improvements in the visual setting of sensitive views within a foreground distance zone. The retention of the existing 69 kV poles and lines for distribution would neither increase nor decrease the degree of

contrast over the existing conditions. Ongoing low contrasts would continue near Redvale and Norwood (Link 1, mile markers 5.6 to 6.3 and 7.2 to 7.5; and Link 2, mile markers 2.6 to 3.1).

SMPA has also suggested removing 1.8 miles of distribution line between the Nucla Substation and SR 145 instead of the 69 kV line. This change would result in similar beneficial effects as removing the 69 kV line, since both lines are similar in height and scale.

Norwood-Sunshine Alternative

Reference KOP C and D, ***Plates VISUAL-7*** *and* ***VISUAL-8***

115 kV Transmission Line Effects

Landscape Impacts. The Norwood-Sunshine Alternative traverses the following landscape character types: Uncompahgre plateau agricultural landscapes (0.8 mile); pinyon-juniper and shrub landscapes (9.5 miles); the San Miguel River tributaries and canyons (0.4 mile); high mesas with adjacent mountain scenery (16.6 miles); and portions of the San Juan Mountains (1.0 mile).

Proceeding south from the Norwood Substation, the 115 kV transmission line would enter pinyon-juniper and shrub/grassland landscapes for approximately 2.8 miles. The visual quality of the natural pinyon-juniper covered landscapes is characterized by homogeneous grey-green colors and mottled textures set against exposed tan soils. The pinyon-juniper habitat typically supports slow growing trees that reach 15 to 20 feet in height. Within the pinyon-juniper landscape character type, the proposed single-pole 115 kV wood pole transmission facility would generally create moderate to low contrasts in line, color and texture.

This alternative would also cross a number of deep canyons of the San Miguel River tributaries, including Beaver Creek, Saltado Creek, Specie Creek, Fall Creek, Bear Creek and Bilk Creek. These canyons are mainly characterized by steep slopes that support a variety of vegetation covers including, among others, Gambel oak, ponderosa pine, Douglas fir, aspen, and riparian species along the drainages. The canyon walls, vegetation and rock outcroppings provide visual diversity in the landscape colors, textures and forms. Strong contrasts in line, form and color could occur where the line would span the canyons and could require orange, white and yellow marker balls. Impacts to the natural settings of the canyons are also anticipated to be high, due to the increased height and scale of the two and three pole structures, and the color contrasts potentially created by marker balls.

Between these canyon crossings, the line would traverse meadows and portions of Beaver, Specie, Wilson and Sunshine Mesas. The scenic character of the mesas is strongly influenced by the adjacent San Juan Mountains and aspen groves that form a mosaic of colors and patterns. Within this landscape character type, the proposed 115 kV line would create moderate to strong contrasts in line, form and color. Although these landscapes have various cultural influences, including a network of roads, fences and homes, distribution lines are absent and the proposed 115 kV poles would be twice as tall, on average, as the existing 69 kV line. In total, this alternative would cross 11.3 miles of open meadows that are considered sensitive to utility corridors, according to San Miguel County's Comprehensive Development Plan (CDP 1998).

Finally, at the eastern end of the project area, this alternative would cross slopes of the San Juan Mountains that flank the Ilium Valley. Similar to the adjoining high mesas and canyons, this character type is considered high in scenic quality. Vegetation cover generally consists of mixed conifers, aspens and Gambel oak that would form a dark green to light grey-green background to the project poles and conductors. Within this setting, the project features would create

moderate to strong contrasts in line, form and color. In total, this alternative crosses 1.9 miles of conifers and 2.0 miles of aspens. Impacts to these landscapes could be high in instances where the transmission line would cause strong contrasts due to the right-of-way clearing.

Sensitive Viewer Impacts. Sensitive viewers potentially affected by this alternative primarily include year-round and seasonal residents, recreationists of the UNF, the Lizard Head Wilderness Area, the Galloping Goose Trail, the Wilson Mesa Trail and visitors to Faraway Ranch, a private recreation resort. Approximately 92 residences are within the foreground distance zone of this alternative, where the increased scale of the poles and hardware may create moderate to strong contrasts in line and form. Impacts within 0.5 mile would range from moderate to high. The majority of these residential viewers is dispersed in agricultural and ranching areas, or is located in various subdivisions or developments. Approved developments within the foreground distance zone of this alternative include the Hillside (Fitts) Subdivision, Beaver Pines, Top of the World, Specie Mesa Ranch, Specie Wilderness, Specie Ridge, Wilson Mesa Ranch and Ptarmigan Ranch. ***Plates VISUAL-7*** and ***VISUAL-8*** are computer-generated simulations of this alternative on Wilson and Sunshine Mesas. Within agricultural and rural residential landscapes south of the Norwood Substation, impacts to residences are assessed as moderate within 0.5 mile of the alignment, and low beyond this distance due to the presence of other similar visual elements (fences, distribution lines, etc.) that would be viewed in scale with the project facilities.

On Specie, Wilson, and Sunshine Mesas, residences within the middleground viewing distance zone may incur visual effects ranging from low to high, depending upon specific viewing conditions, view orientations, and the degree to which there are intervening trees that would screen the Project. Impacts to residences would be high in instances where the poles and conductors directly conflict with scenic views or vistas and/or where long views of the conductors would be visually dominant. Settings incurring high impacts would typically have existing views to few or any similar cultural features or powerlines (distribution or transmission). High impacts could also occur in settings where the increased height of the poles and the conductors would be viewed above the aspen trees. Moderate impacts would be incurred in settings where scenic views are not directly affected, or where intervening aspens, buildings and topography would screen most of the Project from view.

On UNF and BLM lands used for recreation, the upgrading of the existing 69 kV line to 115 kV is expected to result in moderate to weak contrasts in line, form and color over the existing setting. Moderate impacts are identified where the line would cross one mile of the San Miguel River Canyon ACEC. Although the line is within the BLM's established utility corridor, the degree of change between the existing 69 kV line and the proposed 115 kV line would be noticeable. From the Wilson Mesa Trail and Lizard Head Wilderness, the Project would be viewed at middleground distances (one to three miles) and would be set against a landscape currently characterized by other linear features such as roads, fences and the existing 69 kV line. Within this existing landscape setting, the rebuilding of the 69 kV line to 115 kV would create weak contrasts in scale (low impact). Along the Galloping Goose Trail, the visibility of the line would be largely concealed by conifers that flank the trail for most of its route through the Ilium Valley. Where intermittent views to the Project may occur, the visual contrasts in line, form and color would be moderate and incremental when compared to the existing H-frame wood poles of the 69 kV system (low impact). Finally, visual impacts to Faraway Ranch are assessed as moderate to high. The 115 kV line would be located within the foreground viewing distance zone of the resort. The change between the 69 kV and 115 kV would be moderate to strong at this distance. Although other cultural features are viewed, the increased height and scale of the poles would also conflict with scenic view orientations towards the south.

Conformity of Plans and Policies. The Norwood-Sunshine Alternative would cross public BLM lands for 1.1 miles that have been designated as VRM Class II. The degree of visual change brought

about by the Project would not be consistent with the VRM Class II objectives since the poles would be almost twice as tall as the existing 69 kV poles and colored marker balls would be visually prominent. The Project would be an upgrade of an existing powerline and within BLM's established utility corridor, however, where utilities are permitted according to the RMP.

The 115 kV line would also cross 1.1 miles of the UNF, designated as Partial Retention VQO. This part of the UNF is located at the eastern end of the Project in Ilium Valley. In this area, the alternative would mainly entail replacing existing H-frame poles across the mountain slopes with new poles of similar design and scale. Near the Sunshine Substation, this alternative would entail undergrounding an existing distribution line along the South Fork Road in order to provide space for stringing the proposed 115 kV transmission line conductors on double circuit poles together with the existing Sunshine-Telluride line. Overall, the scale of the proposed poles would be very similar to the poles that currently pass through this area. In this regard, the Project would be consistent with the Partial Retention VQO since there would be no net increase in powerlines, or the number or scale of poles.

With respect to San Miguel County, this alternative would not directly conflict with any of the county's scenic goals or objectives. However, the alternative would impact some private landowners' views of scenic vistas and would cross 11.3 miles of open meadows, agricultural fields and pastures that are considered Priority Class 2 by the county.

Substation Effects

Visual changes associated with planned improvements to the Norwood Substation are reported above for the Nucla-Norwood Northern Alternative. The Specie Mesa and Wilson Mesa Substations would be enlarged with this alternative. Visual changes would include increases to the footprint of the substation by approximately 30 feet by 30 feet in order to provide sufficient room for the proposed transformers. Although an increase in size would occur, the substations would still remain as small, subordinate utility features within the larger viewed landscape of the San Juan Mountains and mesas. Increased contrasts in line, form, color and texture would be expected to be weak to moderate in degree and would be visible from Specie Mesa Road (M44) and the Wilson Mesa Estates Road (57.5K) and scattered residences. Potential changes to the Sunshine Substation, which would also consist of enlarging the existing substation approximately 18 feet on the south edge, would be very minor, resulting in only weak changes in line, form, color and texture.

69 kV Transmission Line and Distribution System Effects

This alternative consists of rebuilding the existing 69 kV line to 115 kV. Consequently, changes associated with the 69 kV system are discussed above for the 115 kV transmission line.

Regarding other changes to SMPA's distribution system, the construction of approximately four miles of new three-phase overhead distribution lines between the Norwood and Oak Hill Substations would result in weak contrasts in line, form, and color due to the presence of other similar linear elements within this agricultural setting. The underbuilding of distribution lines on the 115 kV poles across the Fitts Subdivision and Specie Mesa would substantially increase the degree of contrast in line elements, however, over those reported for the 115 kV due to the increased number of lines. Moderate to strong contrasts in line would be expected to result to nearby residences, particularly to homes where open long views of the conductors and distribution lines would be possible.

Norwood-Telluride Alternative

Reference KOP E, F, G, H, I, J, K, and L, ***Plates VISUAL-9, -10, -11, -12, -13, -14, -15,*** *and* ***-16***

115 kV Transmission Line Effects

Landscape Impacts. The Norwood-Telluride Alternative would traverse the following landscape character types: Uncompahgre Plateau agricultural landscapes (0.8 mile); pinyon-juniper and shrub landscapes (9.5 miles); the San Miguel River tributaries and canyons (10.9 miles); high mesas with adjacent mountain scenery (8.3 miles); and portions of the San Juan Mountains (1.1 mile).

This alternative is the same as the Norwood-Sunshine Alternative for the first 16.6 miles, where the line would cross agricultural landscapes, pinyon-juniper landscapes, a number of canyons and tributaries of the San Miguel River, and portions of Beaver and Specie Mesas that are highly influenced by the adjacent scenery of the San Juan Mountains to the south and southeast. Impacts of the Project on these landscape character types are described above for the Norwood-Sunshine Alternative. In total, this alternative crosses 7.4 miles of agriculture and open meadows that are considered sensitive to utility corridors according to the San Miguel County Comprehensive Development Plan (CDP 1998).

At the eastern edge of Specie Mesa, the Norwood-Telluride Alternative would turn northeast and follow the upper benches and slopes of the San Miguel River Canyon, before entering the canyon bottom near Deep Creek (Lime), behind CDOT's maintenance facility (Link 19 mile markers 0.5 to 8.3). Visual elements within the canyon are a rich tapestry of vegetation and rock colors, textures and forms that rise above the canyon floor and river. The landscape character of the river canyon is formed by varied red, tan and grey rock cliffs and extremely steep escarpments that are surrounded by mature aspen groves and numerous conifers. Little to no evidence of cultural modifications is currently evident on the canyon slopes, except for several unpaved roads and a single distribution line that traverses the mountainous slope west of Lime. Visual changes brought about by the Project to this landscape character type would be strong in line, form, and color, especially where the project right-of-way clearing would create a swath, and where poles would be skylined on ridgelines. Strong contrasts would be created where the right-of-way is cleared of aspen and conifer trees. A linear swath would be seen, with contrasting soils exposed. In total, this alternative crosses 8.0 miles of conifers and 2.5 miles of aspens. Strong contrasts would also occur on prominent ridgelines where the poles would be visible. These types of conditions would occur from SH 145, Last Dollar Road, and 58P Road.

Between Deep Creek and the Ilium Valley, the 115 kV line would be located along the south side of State Highway 145 and adjacent to the San Miguel River for 0.3 mile, before crossing the river and SH 145 (Link 20). While the natural scenic quality remains high in this area, cultural features are substantially more noticeable. Scenic quality along this stretch of the alternative is strongly influenced by the flowing San Miguel River, adjacent riparian vegetation and cottonwood trees along the river's edge, and a number of cultural developments, including an existing distribution line, the highway, unpaved roads and trails, and the CDOT maintenance facility (at Link 19 mile marker 8.3). The line then traverses the northern edge of Ilium Valley. Cultural uses of the land, including the Ilium Business and Industrial Park and the sand and gravel operation, strongly influence the visual character of this area. While major natural features (*e.g.*, the South Fork of the San Miguel River and aspen/conifer mountain slopes) provide scenic landscape attributes, the overall character of this area is strongly affected by existing land use patterns and activities. Within these mixed

natural and man-made settings, the Project would cause weak to moderate contrasts in line, form, color and texture.

Sensitive Viewer Impacts. The Norwood-Telluride Alternative would affect the quality of views from a variety of sensitive locations including the San Juan Skyway National Scenic Byway (SH 145) and Keystone Overlook interpretative pulloff; the Last Dollar Road (T60) and County Road P58; the Mt. Sneffels Wilderness and Deep Creek Trail, the Galloping Goose Trail, the Mary E. Day Use Area, the Telluride Ski Area and Gondola; and residential homes located in the San Miguel River Canyon and on the east side of Ilium Valley. This alternative would also affect the San Miguel River ACEC and the San Miguel River Canyon Special Recreation Management Area.

The 115 kV transmission line right-of-way and conductors would be visible intermittently along approximately five miles of the San Juan Skyway Scenic Byway, from east of Sawpit to the vicinity of the South Fork Rd./SH 145 intersection. From the road, the 115 kV transmission line would primarily be viewed from a middleground distance zone, where long views of the conductors would create strong contrasts in line elements during low morning and afternoon lighting conditions. Several guyed poles would also be skylined on the canyon ridge, and the clearing of aspen and conifer vegetation from the right-of-way may also be evident. Overall, the Project would have a high impact on the roadside views, due to both the strong contrasts that the project conductors would impose on the quality of the existing views, the status of the highway as a national scenic byway, and the importance of SH 145 as the gateway to Telluride. ***Plates VISUAL-9, VISUAL-10*** and ***VISUAL-12*** show eastbound highway views; ***Plate VISUAL-11*** shows a westbound view.

From the Keystone Interpretative Site, located west of the Society Turn intersection, the Project would cause weak contrasts in line and form compared to the existing setting. At this locale, the proposed Project would consist of replacing an existing single circuit 115 kV transmission line (that is supported on a combination of wood and steel poles), with a double circuit 115 kV steel pole system. The distribution line that is presently carried on the 115 kV poles would be undergrounded to allow room for the new 115 kV line. As such, the proposed Project conductors would essentially replace the existing distribution line, and would be placed on poles that would be no more than three to five feet taller than the existing structures (Tri-State 1999b). Visual impacts to this area are assessed as low, due to the minor degree of visual changes anticipated. Also viewed from this KOP would be the Telluride Substation Expansion. ***Plate VISUAL-13*** shows a simulation of the substation from the pulloff. The new switchrack would be adjacent to the existing switchrack. Visual changes would be incremental and partially screened by intervening vegetation. Consequently, the Project would result in only weak to moderate changes in views towards Telluride and the substation.

The Last Dollar Road (T60) provides spectacular views of the San Miguel River Canyon and San Juan Mountains in the background. This alternative would be visible intermittently at middleground viewing distances (1.5 to 2.0 miles away) along sections of the road between the Telluride Airport and Hastings Mesa. ***Plate VISUAL-14*** shows a computer-generated simulation of the Project from a pulloff located on the UNF. Views from this pulloff, which is used for both passive recreation and commercial purposes, would be noticeably affected since the proposed conductors, poles and right-of-way clearing would introduce strong cultural contrasts into a natural setting. Strong contrasts in line, form, color and texture would be created by the lines and right-of-way clearings along the upper benches of the river canyon. Exposed soil and required tree trimming would be visually evident, as well as the light conductors that would contrast against the dark green mountain slope during early morning and late afternoon lighting conditions.

Similar viewing conditions and potential high impacts would also occur along County Road P58, where the county road drops down into the San Miguel River Canyon from Hastings Mesa.

The Project would also be potentially visible from the Mount Sneffels Wilderness and Deep Creek Trail, which are located approximately three to four miles north of the alternative. Viewing conditions would be similar to that described above for the Last Dollar Road (T60), although viewed at this greater distance, the Project would be somewhat less noticeable. Impacts would be expected to be moderate in degree, primarily due to the right-of-way swath that would be potentially seen.

The Galloping Goose Trail would be paralleled by this alternative for approximately 1.0 mile from the general vicinity of the Ilium Valley to the Telluride Substation. Although the proposed Project would essentially be located on the trail, the changes in visual character over the existing conditions would be very minor (low impact). At present, the existing 115 kV line utilizes the trail for right-of-way access. As such, this section of the trail is already strongly influenced by the existing 115 kV steel poles, hardware and conductor features. The changes resulting from undergrounding the distribution and installing the proposed 115 kV line on double circuit poles would be minor and incremental to most viewers. Visual changes may be more evident, however, where the line would diverge from the trail and follow Tri-State's existing easement (moderate contrasts). Moderate contrasts would primarily result from the clearing of vegetation along this section of the easement for the underground distribution line.

Views from the Mary E. Day Use Area would also be changed by construction of this alternative. Located in the Ilium Valley, south of the business park and gravel operation, the day use area is used primarily for summer overflow camping during festival weekends. Foreground views from the day use area would be moderately affected, since the proposed 115 kV transmission line would be routed adjacent to this primitive day use area. Moderate to weak contrasts in line and form may result (moderate impact).

Background views from the Telluride Ski Area and Gondola would also be noticeably affected by this alternative. Although located over three to five miles to the east, the canyon and upper benches of the San Miguel River are visible from the gondola. At this distance, strong contrasts would be created where the clearing of conifers and aspen from the right-of-way would result in long views to a cleared swath. The visibility of the Project would also be increased due to the parallel line-of-sight that this vantage point provides. See ***Plate VISUAL-15*** for a simulation of the Project from the ski area.

The Norwood-Telluride Alternative would cross the San Miguel River Canyon ACEC for one mile and the Special Recreation Management Area for 5.3 miles. Impacts to the ACEC are assessed as moderate since the line would be within the BLM's established utility corridor. Visual impacts to the SRMA are assessed as high, since the Project would establish a new utility corridor and create strong contrasts across this area that is used by people engaged in a variety of dispersed uses. In particular, views from the Bilk Creek Road (63.K) would be noticeably affected.

The potential visual impacts of this alternative to residents would occur in the vicinity of the Norwood Substation, across Specie Mesa, near Deep Creek/Lime, at the northeast edge of the Ilium Valley, north of the San Miguel River Canyon near Last Dollar Road (T60) and the Telluride Airport, and along the edge of Lawson Hill. Approximately 81 homes are estimated to be within a foreground viewing distance zone, where the Project would create strong to moderate contrasts in line and form. Visual contrasts would be greatest where the Project would introduce new lines, poles and hardware within natural settings with little to no existing cultural influences. These conditions would occur from several homes located along the north side of the San Miguel River Canyon that currently have views of the San Miguel Canyon and background mountains. The right-of-way clearing and the light conductors against dark green canyon slopes would attract attention, particularly during early morning and late afternoon lighting conditions. Moderate to strong contrasts would also occur from homes located on Specie Mesa, at Deep Creek, and in Ilium Valley. In these settings, the poles

and lines would add to already existing cultural modifications. On Specie Mesa, the increased height of the poles and the additional lines (distribution lines underbuilt) would substantially increase the contrasts in line, form and color over the existing 69 kV system. At Deep Creek the line and poles would be behind the existing CDOT maintenance facility. Within this mixed natural and cultural setting, the contrasts of the Project would be weak. In Ilium Valley, housing located at the eastern edge of the valley would be substantially affected since the poles and lines would cross in front of the existing natural views to the South Fork of the San Miguel River and adjacent mountain slope. ***Plate VISUAL-16*** is a computer-generated simulation of the Project from this residential area. Contrasts from Lawson Hill would be expected to be weak in degree. In this area the Project would be supported on double-circuit 115 kV poles, which would be similar in height, scale, color and texture to the 115 kV poles that currently traverse this area.

Conformity of Plans and Policies. The Norwood-Telluride Alternative would cross public BLM lands for 5.2 miles that have been designated as VRM Class III and 1.0 mile managed as Class II. Due to the changing public attitudes and concerns regarding visual resources, the BLM currently manages VRM Class III lands along the San Miguel River Canyon as Class II. (Pfifer 1999: pers. comm.). The Project would not be consistent with BLM's VRM class II objectives along the San Miguel River Canyon, since the Project would cause strong contrasts in line and vegetation/soil color elements. As noted in the Affected Environment Section (3.11), allowable changes in VRM Class II areas should not be evident or attract attention. Potential changes in other BLM VRM Class II landscapes are similarly not consistent with the VRM Class II objectives; however, such uses are allowable by the RMP and within BLM's established utility corridor.

The 115 kV line would also cross 0.7 mile of the UNF designated as Retention VQO. Visual changes in this part of the national forest would be weak to moderate in degree. In this area, the Project would entail undergrounding an existing distribution line along the Galloping Goose Trail and in Tri-State's existing easement, and constructing a double circuit 115 kV system to support the proposed Project and an existing 115 kV line to the Telluride Substation. Although visual changes brought about by the Project would be weak to moderate, this degree of change is not consistent with the Retention VQO class.

With respect to San Miguel County, this alternative would not be consistent with visual goals of the county including the scenic quality goal for the Telluride region. The County's scenic quality goal is "to preserve and enhance the scenic quality along State Highway 145 for the benefit of residents and the continued viability of the regional area's recreation-based economy which is primarily dependent upon the quality of the physical setting" (CDP 1998). Conflicts with the County's goals are assessed as high.

Substation Effects

Visual changes associated with planned improvements to the Norwood Substation are reported above for the Nucla-Norwood Northern Alternative. The Specie Mesa and Telluride Substations would be enlarged with this alternative. Visual changes at Specie Mesa Substation would be the same as discussed above for the Norwood-Sunshine Alternative. Potential changes to the Telluride Substation would consist of enlarging the existing substation by approximately 10 feet to the north and installing a second switchrack of similar size and scale as the existing equipment (see ***Plate VISUAL-13***). Weak changes in line, form, color and texture would be expected since the substation would retain its existing character and overall scale. This alternative would also entail dismantling the existing Wilson Mesa Substation. The removal of the substation would have a minor, beneficial effect to the scenic quality of the immediate area.

69 kV Transmission Line and Distribution System Effects

This alternative consists of rebuilding the existing 69 kV line to 115 kV from the Norwood Substation for approximately 16.6 miles. Consequently, in this area the visual changes associated with the 69 kV system would be the same as discussed above for the 115 kV transmission line.

On Specie Mesa, distribution would be underbuilt on the 115 kV poles for approximately 2.5 miles, east of the Specie Mesa Substation (Link 13, mile markers 10.6 to 13.1). Contrasts created by the multiple lines would be moderate to strong in contrast. At the point where the 115 kV would diverge from the 69 kV line and establish a new utility corridor along the San Miguel River Canyon, the 69 kV poles and line would be retained for distribution service for approximately 2.1 miles (Link 14 mile markers 0.0 to 2.1). Visual impacts along this section would remain as they are today. Further to the east (Link 14, mile markers 2.1 to 3.2), the existing 69 kV line would be removed and an underground distribution line installed. Short-term strong contrasts in soil and vegetation colors and textures would result until the construction corridor for the underground line has been successfully revegetated (approximately one to three years). East of the Wilson Mesa Substation, the existing 69 kV line and poles would be removed (10.4 miles). The removal of the line in this area would have beneficial visual effects on sensitive viewers located within 0.5 mile to 1.0 mile of the line. Minor reductions in line, form and color contrasts would result.

Regarding other changes to SMPA's distribution system, the construction of approximately four miles of new three-phase overhead distribution lines between the Norwood and Oak Hill Substations would result in weak contrasts in line, form, and color due to the presence of other similar linear elements within this agricultural setting. The underbuilding of distribution lines on the 115 kV poles across the Fitts Subdivision and Specie Mesa would substantially increase the degree of contrast in line elements, however, over those reported for the 115 kV due to the increased number of lines. Moderate to strong contrasts in line would be expected to result to nearby residences, particularly to homes where open long views of the conductors and distribution lines would be possible.

3.10.2.3 IMPACTS OF THE SUBALTERNATIVES

115 kV Transmisson Line Routing Alternatives

Subalternative A *Reference KOP B,* ***Plate VISUAL-17****.* – Subalternative A would entail routing the 115 kV transmission line down into Naturita Canyon along the Southern Alternative, rather than spanning the canyon rim to rim. The subalternative would avoid the need for marker balls, and would reduce the degree of visual contrast in line elements that the conductor would have from middleground viewing distances east of the canyon rim. Partial views of the conductors may still create strong contrasts in certain lighting conditions. Long views of the conductors would be avoided, as well as the strong contrasts potentially created by the orange, white and yellow marker balls. For people engaging in recreational pursuits in the canyon, the three-pole guyed structure at the bottom of the canyon would cause isolated strong contrasts in line and form with the natural canyon setting. Overall, the visual contrasts of this subalternative are assessed as moderate in degree. ***Plate VISUAL-17*** shows a simulation of the Project located along Subalternative A.

Subalternative B Subalternative B would route the 115 kV transmission line to the north of the Hillside (Fitts) Subdivision and would entail retaining the existing 69 kV line, currently located through the subdivision, for distribution service. The visual contrasts of this alternative are assessed as strong, since the 115 kV poles and conductors would be sited in the foreground viewing distance zone of several subdivision homes and would directly conflict with the northerly panoramic view orientations that these homes have. Contrasts would also

be strong due to the cumulative effects of the 115 kV line and poles with the existing 69 kV line and poles that would remain. (High Impacts.)

Subalternative C Subalternative C would route the 115 kV transmission line west and south of the Hillside (Fitts) Subdivision and would entail retaining the existing 69 kV line, currently located through the subdivision, for distribution service. The visual contrasts of this alternative are assessed as weak to moderate, since the 115 kV poles and conductors would be only partially visible through the pinyon-juniper tree cover in this area. Cumulative contrasts with the existing 69 kV line and poles that would be retained are also assessed as weak to moderate. (Moderate Impacts.)

Subalternative D Subalternative D would generally have low visual impacts due to the lack of sensitive viewers and the similarity of linear features that are found in this area near the Oak Hill Substation. Set in this agricultural setting along road and property boundaries, the subalternative would repeat the lineal types of features currently viewed, including the existing 69 kV line and distribution lines.

Subalternative E *Reference KOP M, **Plate VISUAL-18.*** – Subalternative E would route the 115 kV transmission line along the south side of the San Miguel River and avoid two crossings of SH 145 that would occur with the Norwood-Telluride Alternative. This subalternative would also entail relocating the existing distribution line south of the river and underbuilding it with the 115 kV system. As such, the visual effects associated with the existing distribution line crossing SH 145 twice would be eliminated. Overall, the visual effects of this subalternative are assessed as weak to moderate. For most of its distance, the 115 kV poles and conductors would be screened from the highway by cottonwoods and other riparian vegetation along the riverbank (see ***Plate VISUAL-18***). The dark color of the wood or steel poles would blend well with the conifers. The line would become more visible, however, along SH 145 where it would follow the northern slopes of the San Miguel River Canyon west of the South Fork Road turnoff. Visual contrasts in this area would primarily be created by the light conductors set against the dark green conifers. Due to the north-facing slope conditions in this area, the potential for increased impacts from the lines due to early morning and late afternoon lighting conditions would be reduced. This subalternative would be more consistent with the County's scenic quality goals for the Telluride Region and SH 145 than the corresponding section of the Norwood-Telluride Alternative that it would replace.

Underground Subalternative

The Underground Subalternative would have long-term beneficial visual consequences to private residents and landowners on Beaver, Specie, Wilson and Sunshine Mesas. The existing 44/69 kV line would be dismantled and the new 115 kV line would be installed in an underground cable. Although the landscape would be disturbed along the length of the right-of-way during construction, post construction revegetation of the mesas would restore the landscape to pre-construction conditions within several years. The existing poles and wires would be removed and the installation of taller poles and conductors would be avoided. The beneficial effects of removing the existing line and avoiding the installation of larger poles is considered significant on these scenic mesas. Some adverse visual effects would remain, however, where views to the overhead/underground structures occur. These structures would be required at the edges of the mesas where the line would transition from overhead to underground. These structures would be similar in height to the proposed 115 kV poles.

Norwood Substation Alternative Site B

Development of the Norwood Substation at Alternative Site B would result in minor visual impacts. This site is located further south, and away from residents of Norwood. Compared to the existing substation, which is openly visible from various residential and highway

viewing vantage points, Alternative Site B is not visible from most areas of the valley. Topography and vegetation would provide screening for the facility.

3.10.2.4 CUMULATIVE EFFECTS

Cumulative visual impacts are evaluated based upon the types and occurrences of other proposed projects that are within three miles of each of the alternatives. Reference should be made to *Plate CUMULATIVE-1* in reviewing this section. The following summarizes the potential cumulative effects by alternative:

Nucla-Norwood Northern Alternative – No cumulative visual effects are anticipated with this alternative. Buildout of existing approved developments may occur, continuing to change agricultural settings to more residential uses. No substantial cumulative effects are anticipated since the character of the landscape would not change appreciably over the existing conditions.

Nucla-Norwood Central Alternative – Several planned burn areas, as well as approved developments, are within the project area. The visual character of existing pinyon-juniper landscapes would be changed to more open grassland landscapes for the short term. In these settings, the proposed Project may have increased visibility due to the removal of trees that currently provide screening. Areas that are scheduled for burns are generally away from homes and viewers. No substantial cumulative effects are anticipated. Potential changes associated with buildout of approved developments would be the same as described above for the Northern Alternative.

Nucla-Norwood Southern Alternative – Cumulative impacts associated with the Southern Alternative would be similar to those described above for the Central Alternative. The natural landscape qualities of Naturita Canyon would be further altered if prescribed burns occurred in the area of the transmission alternative.

Norwood-Sunshine Alternative – Cumulative impacts along this alternative would result from the buildout of various developments that have been approved by San Miguel County and SMPA's potential expansion of the Specie and/or Wilson Mesa Substation to approximately 1 acre. Numerous subdivision developments are within three miles of this alternative. The buildout of these areas for residential uses would continue to convert open meadows and aspen groves on the high mesas to rural community settings. Most of these subdivisions contain large lots that would allow the retention of the natural scenic attributes of the landscape. Residential developments would nonetheless increase the number of roads and structures, thereby increasing the overall influence of cultural features on the natural environment. The cumulative visual effects of the 115 kV transmission line and SMPA's potential expansion of the Specie and/or Wilson Substations would be significant, however, on landscape quality and future residential views. Cumulatively, these power projects would convert open meadows to industrial uses, creating a predominantly utility character in the vicinity of the substation(s). Cumulative visual effects could substantially affect scenic views up to 2+ miles of these facilities, depending on viewing conditions. Cumulative effects on Specie Mesa would apply to both the Norwood-Sunshine and Norwood-Telluride Alternatives. Cumulative effects on Wilson Mesa pertain to the Norwood-Sunshine Alternative only.

Norwood-Telluride Alternative – Cumulative visual effects associated with this alternative would occur in three general locales: in the western and central high mesa areas, where approved developments may be built out; and at the eastern end of the Project where the buildout of the Ilium Business and Industrial Park and the development of the San Miguel River Hydroelectric Project may occur. Cumulative visual effects associated with the buildout of approved developments would be the same as described above for the Norwood-Sunshine Alternative. At the eastern end of the project area, the buildout of the Ilium Business and Industrial Park and the development of the San Miguel River Hydroelectric Project could

result in substantial cumulative changes to the visual character of the Ilium Valley (north end) and from SH 145. Overall, the landscapes at the north end of Ilium Valley would continue to transition from natural sites to developed cultural landscapes of a commercial and industrial nature. Within this setting, the proposed Project would contribute to these changes, and generally would be visually compatible with the planned use of this area. Further to the east, between the Telluride Substation and the Ilium Valley, the development of the San Miguel River Hydroelectric Project in conjunction with the proposed powerline could also cumulatively contribute to noticeable changes to highway views. Foreground highway views in this area would likely change from predominantly natural landscapes to landscapes with more noticeable industrial influences.

3.10.2.5 POTENTIAL MITIGATION MEASURES AND RESIDUAL EFFECTS

Mitigation Measures

115 kV Transmission Line Measures

1. Pole designs – where the Project would parallel other existing transmission lines. The visual contrasts of the poles and conductors would be reduced where similar pole structures can be used and spaced the same as existing facilities. Consistent pole designs and spacing would reduce the contrasts in line and form elements and the degree of visual clutter created in utility corridors. Within the project area, this measure would generally apply to corridors currently supporting H-frame structures.

2. Pole designs – in agricultural and rural residential cultural environments. To the degree possible, the single pole design should be used in these areas in order to minimize potential form contrasts. In comparison to the H-frame structure, the single pole design provides greater similarity in line and form elements to other existing cultural influences associated with agricultural and rural residential areas.

3. Pole designs – in high mesa areas characterized by aspen groves. Feasible alternative single pole designs, that would be shorter than the typical single poles currently proposed by Tri-State (65 feet to 97 feet), should be considered in aspen/meadow landscapes as a means to keep the poles in scale with existing vegetation screening. Pole heights of 55 feet to 60 feet are recommended through or adjacent to aspen groves to substantially screen the poles and conductors. The reduced pole heights would also reduce the potential for long views of conductors in these types of settings.

4. Pole materials – In order to minimize the degree of color contrast created in aspens, conifer forests, and pinyon-juniper landscapes, two types of pole moisture treatments should be considered. Utilities typically use a creosote-based or pentachlorophenol (penta) coating that results in very dark pole tones. These eventually (within five plus years) lighten up to a medium-dark pole tone. This type of treatment is best suited for conifer forest areas and in agricultural settings with similar dark wood fences, distribution lines, etc. As an alternative, chromated copper arsenate (CCA) can be used to treat poles and for moisture protection. This type of treatment results in lighter, slightly green-toned poles that would reduce the potential color contrasts of the Project in areas supporting aspens, open natural meadows and sage scrub vegetation cover. Winter landscape tones should be considered in selecting the best pole treatment in any given area since this is the longest season.

5. Pole materials – wood versus steel material. Steel poles should be considered in specific locations where wood poles would require extensive guying for support and stability. Guyed wood poles would be required at angle points, and can substantially increase contrasts in line and form in instances where extensive guying is required. In areas of visual sensitivity, it is recommended that a range of pole designs and materials/colors

be considered, including corten steel, where a dark brown tone would be best, and dulled, galvanized steel, where grey tones would be more desirable.

6. Pole placements – in visually sensitive areas, careful pole placements could reduce the degree of visual conflict with scenic view orientations. It is recommended that Tri-State provide landowners flexibility in the placement of poles, as well as the type of pole and pole material used. Poles should be sited to avoid skylining on ridges to the maximum extent possible. In agricultural areas, poles should be placed along field boundaries to the extent possible to avoid visual cluttering, as well as conflicts with agricultural operations.

7. Closure of access roads – in visually sensitive areas. Following completion of the project construction phase, access roads improved or widened for the Project should be reseeded with natural plant species to reduce long-term contrasts in soil and vegetation colors and textures. Coordination between federal land management landscape architects and biologists should occur to determine the most appropriate seed mixes.

8. Minor reroutes – specifically, at canyon crossings to minimize the need for marker balls; in Redvale to minimize visual impacts to local residents; and in open meadows, where adjacent aspen groves or conifers may be used to visually screen the project poles and conductors. During final design, it is recommended that areas where minor reroutes could substantially reduce potential visual effects be considered in final routing and pole placement. Tri-State should coordinate with landowners and/or homeowner associations to determine specific siting opportunities that would reduce visual effects to the greatest extent possible.

9. Undergrounding of transmission line – In accordance with Tri-State's policy regarding undergrounding, this measure should be considered, where feasible, by landowners who wish to fully reduce the long-term visual impacts of the Project. The feasibility of implementing this measure would depend upon both financing and terrain conditions. Unfeasible locations would include, among others, at canyon crossings and on steep slopes susceptible to soil erosion and slope instability.

Substation Facilities

10. Norwood Substation – In order to minimize the degree of contrast created by expanding the existing Norwood Substation, a landscaping plan should be implemented that would partially screen the new switchracks. Pinyon-juniper and sage scrub vegetation should be considered to visually blend with the existing site. Taller conifers should be considered as well to screen the substation equipment. Implementation of the landscape plan should include monitoring for two to three years and the replacement of any plants that do not survive. A medium grey/brown tone should be used for the cement substation pad to blend with the characteristic landscape colors. Fencing recommendations are chain link fencing with black PVC coating. This type of fencing material would reduce potential visual contrasts with background vegetation and substation equipment.

11. Specie Mesa and Wilson Mesa Substations – In order to reduce the potential visual effects of expanding the Specie Mesa or Wilson Mesa Substation, it is recommended that landscape plans be implemented to screen the substations from local roads (*i.e.*, M44 Road and 59.K Road) and nearby residents. Within these types of open meadow and aspen grove landscapes, aspen trees or other tree species of similar scale, color and texture should be used for screening. The landscaping should be monitored for two to three years to ensure successful establishment of plant species. Watering of plants and the replacement of any plants that do not survive should be implemented. The landscape plan should also incorporate chain link fencing with black PVC coating to

reduce the visibility and contrasts associated with the substation equipment. (See Norwood Substation discussion above.)

12. Sunshine Substation – In order to reduce the potential visual effects to the UNF and to a nearby residence, the landscape plan for this substation should incorporate stands of aspen trees on the south side and chain link fencing with black PVC coating.
13. Telluride Substation – The expansion of this substation would be visible from the San Juan Skyway National Scenic Byway and Interpretative Site Pull off. In order to minimize the visual effects of the Project, it is recommended that the color and material of the new switchrack be made to match the existing switchrack facility. A landscaping plan that would incorporate conifers around the facility should be developed, implemented and monitored for two to three years for success. Plant species that don't survive should be replaced. Fencing around the substation should minimize the visual contrasts of the equipment to the extent possible. Various fencing materials, including chain link fencing with black PVC coating, should be considered.

Distribution Modifications

14. Distribution lines should be buried underground in visually sensitive areas where undergrounding is feasible. The undergrounding of distribution lines would substantially reduce the degree of contrasts created by lines and conductors during low lighting conditions. Specific areas where this measure should be considered include through the community of Redvale, through the Hillside (Fitts) Subdivision, and across Specie Mesa.

The following summarizes the applicable mitigation measures by alternative and the degree of residual effects (high, moderate or low) that would remain after the implementation of these measures:

Nucla-Norwood Northern Alternative - With implementation of potential mitigation measures 2, 4, 6, 7, 8 and 10, visual impacts to sensitive viewers and landscapes would be moderate to low.

Nucla-Norwood Central Alternative - With implementation of potential mitigation measures 1, 2, 4, 6 and 10, visual impacts to sensitive viewers and landscapes would be moderate to low.

Nucla-Norwood Southern Alternative – With implementation of potential mitigation measures 1, 2, 4, 5, 6, 7 and 10, visual impacts to sensitive viewers and landscapes would be moderate to low in degree, except at the crossing of Naturita Canyon, if marker balls cannot be avoided. High residual impacts to nearby residents may remain. Implementation of Subalternative A would likely reduce the need for marker balls in this location.

Norwood-Sunshine Alternative - With implementation of potential mitigation measures 2, 3, 4, 5, 6, 7, 8, 9, 11, 12, and 14, most visual impacts would be moderate to low in degree. High residual impacts may remain at canyon crossings if marker balls cannot be avoided and to specific residences within foreground or middleground distance zones where the Project conflicts with scenic views. Residual effects would be high if undergrounding options could not be implemented and the Project posed a direct conflict with natural landscape scenic views.

Norwood-Telluride Alternative – Potential mitigation measures that would reduce visual effects of this alternative to moderate levels include measures numbered 2, 3, 4, 5, 6, 7, 8, 9, 11, 13 and 14. High residual visual effects would remain, however, where the right-of-way clearing and pole skylining along the San Miguel River Canyon would be visible from the Telluride Ski Area, the San Juan Skyway Scenic Byway, County Road P58, the Last Dollar Road, and from residences north of the San Miguel River Canyon. Implementation of Subalternative E would help reduce the visual effects to the scenic byway, however, high residual effects may remain

in other locations where right-of-way clearings or pole skylining are evident (*e.g.*, east of Silver Pick Road (60.M)).

3.10.2.6 IMPACTS OF THE GENERATION ALTERNATIVES

The potential long-term visual effects of the generation alternatives include the following types of changes: 1) development of a generator site could create an industrial character in or near scenic areas of Telluride, depending upon the type of generator, enclosure and landscaping used; 2) operation of a generator could cause a visible vapor plume during the winter months, contributing to the industrial character of the site and potentially impairing visibility along local roads, SR 145 and at the airport; 3) the operation of a generator could potentially impair the visibility conditions at Class I and II Wilderness areas; and 4) depending on the alternative, a Generator Alternative would still result in visual impacts from transmission, substation and distribution changes similar to those previously described for the Transmission Alternatives. Section 3.2 Climate and Air Quality and Section 3.9 Land Use discuss the issue of potential impaired visibility effects to wilderness areas. The potential for these various types of effects depends in part on the type of generator used and the location of the site. A summary of the issues by alternative is presented below.

Large Generator Alternative - This alternative would potentially have the greatest adverse visual effects at a generator site, due to the scale and size of the generator facility. *Figure 2.2-3* (Chapter 2.0) shows a photograph of a GE Frame 6 unit. The generator would be 95 feet by 35 feet with the stack and inlet filter reaching 50 feet. The industrial character of such a facility would be caused in part by the vapor plume in the winter months that could reach 100 feet in height. While architectural treatments would have the potential to substantially reduce the industrial character of the generator, the vapor plume and the large scale of the facility would remain.

Viewers potentially affected by this facility would include residents in the Telluride Area, visitors and tourists to Telluride and the Uncompahgre National Forests, visitors to the Telluride Airport and travelers along local roads and scenic byways. Visitors to the wilderness areas may also be affected by impaired visibility conditions (See Section 3.2 Climate and Air Quality).

The Large Generator Alternative would result in visual changes to transmission, substation and distribution facilities between the Nucla and Norwood Substations. Between Nucla and Norwood Substations, the existing 44/69 kV line would be rebuilt as a state-of-the-art 69 kV system. Figure 2.3-1 shows a comparison of the 69 kV pole design (average height 56 feet, 5 inches) to the proposed 115 kV pole design (average height 70 feet). (See Nucla-Norwood Alternatives visual impact discussions). Between Norwood and Sunshine, the Large Generator Alternative could result in beneficial effects, compared to the proposed Transmission Alternatives. Between these two substations, the existing 44/69 kV transmission line could either remain in place on Specie, Wilson and Sunshine Mesas and be used as a distribution line, or be removed if distribution service is placed underground.

Small Generator Alternative - *Figure 2.2-4* (Chapter 2.0) shows a photograph of an enclosed Solar Titan 130 Generator. The generator would be 48 feet long by 14 feet wide with the stack and inlet filter reaching 25 feet. The visual compatibility and character of such a facility could be addressed through careful architectural treatment. The vapor plume that could occur during the winter months and reach 100 feet in height would not be avoidable, however. Consequently, visual character impacts remain a concern for this type of facility and alternative.

Viewers potentially affected by this facility would include residents in the Telluride Area, visitors and tourists to Telluride and the Uncompahgre National Forests, visitors to the Telluride Airport and travelers along local roads and scenic byways. Visitors to the wilderness

areas may also be affected by impaired visibility conditions (See Section 3.2 Climate and Air Quality).

The Small Generator Alternative would also result in visual changes to transmission, substation and distribution facilities between the Nucla and Sunshine Substations. Between Nucla and Sunshine, the existing 44/69 kV poles would be rebuilt as a state-of-the-art 69 kV system. A comparison of the visual scale and character of a rebuilt 69 kV pole (average height 56 feet, 5 inches) with the proposed 115 kV poles (average height 70 feet) is shown in *Figure 2.3-1*. Overall, visual impacts would be very similar as previously reported for the 115 kV alternatives. (See impact discussions for the Nucla-Norwood Alternatives and Norwood-Sunshine Alternative).

Emergency Generator Alternative – The Emergency Generator Alternative would also consist of smaller generators. See *Figure 2.2-4* photograph of an enclosed Solar Titan 130 Generator. The generator would be 48 feet long by 14 feet wide, with the stack and inlet filter reaching 25 feet. The visual compatibility and character of such a facility could be addressed through careful architectural treatment. The potential for a vapor plume that may be seen during the winter months and reach 100 feet in height would be infrequent, occurring only when the facility is in operation. Consequently, visual character impacts are not a major concern for this type of facility and alternative.

Viewers potentially affected by this facility would include residents in the Telluride Area, visitors and tourists to Telluride and the Uncompahgre National Forests, visitors to the Telluride Airport and travelers along local roads and scenic byways. Visitors to the wilderness areas may also be affected by impaired visibility conditions (See Section 3.2 Climate and Air Quality).

The Emergency Generator Alternative would also result in visual changes to transmission, substation and distribution facilities between the Nucla and Sunshine Substations. The visual impacts of these facility changes would be the same as summarized above for the Small Generator scenario.

3.10.2.7 NO ACTION ALTERNATIVE

The No Action Alternative would essentially represent a continuation of visual contrasts currently created by the 69 kV line. These contrasts are generally in the low to moderate range of visual effects due to the small scale of the poles and the similarity of this facility with other distribution lines and cultural features (fences, barns, roads, etc.). Over time, the No Action Alternative would entail replacing individual poles as the integrity of the system continues to degenerate. Visual contrasts in form and color would increase as poles are replaced, since the new poles would likely be both darker and taller than the existing ones.

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3.11 SOCIOECONOMICS

ISSUES: Primary issues raised during scoping included the potential impacts of the transmission line on individual private property values, as well as the potential effects of unreliable power on the Telluride area and tourism economy as a whole. Other issues discussed in this section are the short-term and long-term economic and social effects of the project construction and operation on local communities' and the counties' services and facilities. Social values regarding energy conservation and alternative energy technologies are also documented.

3.11.1 AFFECTED ENVIRONMENT

OVERVIEW OF COMMUNITY CULTURE AND VALUES

The culture of the project area reflects diverse interests that are rooted in the rural ranching, agricultural, and mining heritage of the region, as well as the recent growth of tourism, second-homes and recreation in the Telluride Area. The west end of Montrose County largely retains the historic ranching and farming culture and community character that has predominated the region over the last 100 years. In San Miguel County, there are a wide range of cultural and social values that encompass both farming and ranching interests as well as changes brought about by the growth of Telluride and the accompanying ski tourism and recreation industries. The social context of the Telluride area has changed considerably over the last 30 years with the development of the Telluride Ski Area Resort, and the subsequent transition from an agricultural based economy to a primarily tourist driven economy.

Scoping comments reflected the social concerns that residents have about the Project and lands potentially affected. In the west end of Montrose County, growth and change have been slow, and expressed concerns primarily revolve around the potential impacts of the Project on private property rights and land uses. In San Miguel County, the majority of concerns expressed revolve around the issue of growth and related impacts. Tension between growth advocates and those less supportive of growth has become more evident in recent years. Issues which contribute to the social concerns of the resident population include preserving and maintaining a sense of community, opportunities for energy conservation and alternative energy development, affordable housing as it relates to local resident income, traffic congestion and alternative transportation opportunities, maintaining and improving air quality, environmental preservation of open space and agricultural lands, and preserving the physical and scenic settings for residents and tourists alike.

Between 1995 and 1999, a number of community-wide surveys and group discussions occurred as part of the Telluride Regional Growth Management Process. In the Telluride region, the Citizen Planning Advisory Committee (CPAC) completed the Telluride Area Land Use and Transportation Report Plan (October, 1998), which encompasses an area of approximately 27 square miles. The Plan recommendations embody the environmental, social, and economic visions of the region for the future. During the course of 11 meetings, CPAC developed goals, objectives, and components relating to transportation, air quality, environmental protection, energy conservation, community character, and economic and fiscal analyses.

These planning efforts documented general philosophies about future development. While the Towns of Telluride and Mountain Village often hold different views regarding growth, it appears that the majority of the local residents want to plan for the inevitable growth, while preserving the values that have made the area attractive to residents and visitors alike. Those values include among others, preserving the environmental and scenic qualities of San Juan Mountain, retaining the rural mining character of the Telluride area, and improving air quality and transportation systems.

PROJECT-RELATED COMMUNITY CONCERNS

The Telluride Area has been experiencing increasing power outages and reduced power reliability over the past 10 years due to both the age of the existing transmission system and the increase in population and power consumption. Chapter 1.0 describes the need for increased power reliability in the Telluride Area. In response to Tri-State's proposal to improve power reliability by rebuilding the existing Nucla-Sunshine 44kv/69 kV to 115 kV, the San Miguel County Commissioners formed the San Miguel Energy Research Group (SMERG) in the fall of 1998 to research pertinent issues regarding energy use and development within the project area. The group was charged with developing both the short and long term recommendations for the County to consider. SMERG's short-term goals were to recommend to the Board of County Commissioners (BOCC) whether to proceed with the new powerline proposal (and a recommendation on siting), or whether to propose an alternative to the powerline. Long term goals of the committee were to consider a number of issues including energy consumption in the Telluride region, the potential for regional energy generation and energy conservation, assessing the potential effects of deregulation of the energy industry, drafting an energy policy, and quantifying future energy requirements with and without an energy policy. The SMERG meet between the fall of 1998 and 1999 and retained Competitive Utility Strategies (CUS) to evaluate whether distributed generation alternatives to the proposed Nucla-Telluride 115 kV transmission line should be considered. (Perrin 1999: pers. comm.). CUS presented their findings in December 1999 (CUS 1999). In response to the CUS Report, the Forest Service retained an independent consultant, Alternative Energy System Consulting, Inc. (AESC) in early 2000 to develop the generation alternatives that are considered in this EIS. The generation alternatives are described in Chapter 2.0 and evaluated in respective sections of Chapter 3.0

POPULATION AND DEMOGRAPHICS

Table 3.11-1 presents the population levels for Montrose and San Miguel Counties, Nucla, Naturita, Norwood, Sawpit, and Telluride from 1993 to 1997. Population in San Miguel County has increased from 4,701 in 1993 to 5,567 in 1997, an 18.4 percent increase, and 4.3 percent average annual increase. Telluride's population has increased from 1,361 in 1993 to 1,867 in 1997, a 37.2 percent increase and average annual increase of 8.2 percent (Colorado Division of Local Governments (CDLG 1998)). Montrose County has grown from 27,089 to 30,996, a 14.4 percent increase and average annual increase of 3.4. As can be seen from the statistics, both counties are growing at a rapid rate. Growth in Telluride is affecting outlying areas in San Miguel and Ouray Counties and, to some degree, areas in Montrose County. Based on the latest statistics, the largest estimated increase in population in Telluride occurred between 1993 and 1994 with annual growth rates for San Miguel County and Telluride at 7.9 and 38.2 percent, respectively. In contrast, the Town of Nucla has a rather depressed economy and has maintained a very low growth rate. No major economic activity is occurring in Nucla. Some of the communities along Highway 145 are gaining population as bedroom communities for Telluride.

Table 3.11-1
Population Growth in the Project Area

	1993	1994	1995	1996	1997	% Increase 1993-1997
San Miguel County	4,701	5,073	5,194	5,432	5,567	18.4
Norwood	511	501	548	578	575	12.5
Sawpit	46	46	43	44	44	(4.3)
Telluride	1,361	1,881	1,803	1,861	1,916	40.8
Mountain Village	NA	NA	545	559	607	11.4
Montrose County	27,089	28,211	29,308	30,036	30,996	14.4
Nucla	704	718	723	729	738	4.8
Naturita	464	472	477	478	488	5.2

Source: Colorado Division of Local Governments, 1998
NA - Not available

Peak season population and seasonal employment are also important figures to consider in evaluating existing conditions. Public facilities and services infrastructure is based on peak populations. In the Telluride region (Telluride, Mountain Village, and outlying area), the peak seasonal population capacity for 1997 was estimated at approximately 7,637 (CPAC 1998). This figure includes permanent residents, seasonal residents, and visitor pillows to the area. Projected increases for peak build-out show peak population forecasts for 2020 in the range of 8,469 to 8,606 for resident population and 11,209 to 12,350 for peak visitor population (CPAC 1998).

Recent growth in the project area can be attributed largely to factors related to the national economy, increased marketing of the Telluride area, the expansion and rising popularity of the Telluride Ski Resort, summer activities in the area (including festivals), and the ambiance of the Town of Telluride.

Future growth rates in Telluride will depend largely on tourism, future planning decisions, and the development of a sound growth management plan for the town. Telluride residents are concerned about future growth patterns, and many are participating in the development of the Telluride Region Growth Management and Transportation Alternative. Projected build-out in the defined Telluride Region is around 20,000 people, including residents and visitors.

Growth in other parts of the project area are tied somewhat to the growth in Telluride. The western portion of the project area has few economic development opportunities. However, population is projected to increase in San Miguel County from 6,430 in 2000 to 9,088 in 2010 a 41.3 percent increase (CDLG 1998). Annual increases are projected to taper off starting with a four percent growth rate, declining to a 2.6 percent growth rate. Population in Montrose County is expected to increase from 33,512 in 2000 to 42,048 in 2010, a 25.5 percent increase. Montrose County is projected to grow at a slower pace than San Miguel County, between 2.5 and 2.1 percent annually.

ECONOMIC SECTORS AND EMPLOYMENT

The economy in San Miguel and Montrose Counties within the project area has historically depended on agricultural activity including grazing, cattle and calf sales, mining, and tourism. Since the development of the Telluride Ski Area, tourism has supplanted agriculture and mining as the primary economic base in San Miguel County. The services and trade sectors represent over 66 percent of total employment in San Miguel County; however, the annual wages are generally lower than in any other employment sector. In San Miguel County many of the trade and service sector jobs are directly and indirectly associated with the ski and recreational tourism industry. Consequently, the majority of employment opportunities in the Telluride region is relatively low paying, and are often seasonal positions. The Telluride Ski Area is one of the primary seasonal employers in the area. The Telluride Ski and Golf Company employs a total of 225 year-round employees, 775 winter seasonal employees, and 245 summer seasonal employees (Sallee 1999: pers. comm.).

The City of Montrose is a regional service and trade area with a diverse economy serving the entire region including San Miguel County. However, within the project area the economic base remains agriculture, and public utilities employment is provided at the Nucla Generating Facility. Western Montrose County is somewhat depressed economically and is pursuing other economic development opportunities. *Table 3.11-2* shows average annual employment and wages by sector.

The average annual wage for 1997 among all San Miguel and Montrose County employees was estimated at $21,744 and $21,669, respectively (Colorado Department of Labor and Employment (CDLE 1998)). The Services and Trade sectors represent some of the lowest wage rates of any of the local industrial sectors, between $13,581 and $19,441 (CDLE 1998).

Considering the large percentage of workers in these lower paying sectors and the high price of housing in the project area, demand for affordable housing in the Telluride region and the surrounding area is greater than the current supply.

Due to the nature of the tourist economy, the body of the labor force is transient or seasonally employed. *Table 3.11-3* shows labor force estimates from 1994 through June, 1998. These figures do not reflect the quarterly fluctuations in the labor force between peak seasons (winter and summer). A 4.0 percent unemployment rate is considered essentially full employment in any given economy (Rieser 1994), which suggests that at certain times of the year there is a limited supply of labor available for additional employment. In the Telluride region this occurs during the ski season and the peak summer season.

Table 3.11-2
1997 Annual Average Employment and Wages

Industry	San Miguel County		Montrose County	
	Employment	Wages	Employment	Wages
Private	3,581	$20,807	9,240	$20,136
Agriculture	58	$15,575	300	$15,478
Mining	D		103	$37,406
Construction	448	$31,434	935	$17,251
Manufacturing	113	$27,825	1,495	$23,251
T.C.PU	70	$34,990	863	$32,015
Retail Trade	1,010	$13,581	2,393	$15,019
F.I.R.E.	467	$26,154	370	$25,686
Services	1,371	$19,441	2,138	$18,069
Government	532	$28,055	2,459	$27,430
Total	4,113	$21,744	11,699	$21,669

Note: TCPU -Transportation, Communications, Public Utilities
F.I.R.E. - Finance, Insurance, Real Estate
Colorado Department of Labor and Employment

Table 3.11-3
Labor Force Summary

Year	Labor Force	Employed	Unemployed	%
San Miguel County				
1994	4,048	3,906	142	3.5
1995	4,395	4,209	186	4.2
1996	4,212	4,003	209	5.0
1997	4,157	3,976	181	4.4
Jan. through June, 1998	4,496	4,266	230	5.1
Montrose County				
1994	13,901	13,205	696	5.0
1995	14,648	13,788	860	5.9
1996	14,687	13,628	1,059	7.2
1997	15,080	14,270	810	5.4
Jan. through June, 1998	15,708	14,667	1041	6.6

Colorado Department of Labor, 1998

The labor force in San Miguel County more than doubled between 1990 and 1995 at an annualized rate of 15.4 percent. However, the last large increase was in 1994 with an annualized rate of 12.6 percent. In 1995, the labor force grew at a rate of 8.7, in 1996 the labor force declined at a rate of 4.2 percent, in 1997 it declined again by 1.3 percent, and in June of 1998 the San Miguel labor force was estimated at 4,496, an increase of 8.2 percent. The average estimated unemployment rate between January and June, 1998 was 5.1 percent (CDLE 1998).

Montrose County has a much larger labor force, but also experiences seasonal fluctuations due to the high level of agricultural production and government employment. Average annual employment rates are relatively high for current economic conditions. During the period 1994 to June, 1998 unemployment rates ranged from 5.0 to 7.2 percent, showing the volatility of the seasonal markets. This also suggests that the Montrose area has a rather large labor force to draw from and may be able to provide labor for seasonal projects.

HOUSING

Housing and housing affordability have become major issues throughout the project area. As the population increases and land values escalate due to the tourist economy in the Telluride region, affordable housing is harder and harder to find. Housing prices and vacancy rates in communities within commuting distance of the resort area have been affected by the shortage of affordable housing.

The most recent statistical housing data available for San Miguel and Montrose Counties is from the Colorado Division of Local Government Housing Unit Counts and Estimates for Colorado Regions, Statistical Areas and Counties, 1980-96. San Miguel County had an estimated 3,809 units in 1996, compared to 11,645 in Montrose County. Most of the increase in housing units over the period in San Miguel County occurred in the Telluride region. Over 90 percent of the population live in Montrose, within the City of Montrose or the outlying area (Region 10 Review 1998).

According to the 1995 Telluride Region Growth Study updated per 1996 Housing Needs Assessment (HNA), 56 percent of total housing units in the Town of Telluride were local residents, and 63 percent were local in Mountain Village. Telluride has an approximate 20,000 person density cap which will limit the number of housing units that can be built in the region, another factor affecting the cost of housing in the area. According to the 1998 Telluride Land Use and Transportation Report (CPAC), 2,540 dwelling units existed in 1996. Based on a cap of 7,180 units, an additional 4,640 units (permanent and temporary accommodations) could be built in the Telluride region.

Single family houses and mobile homes have declined as a percentage of total housing units as multi-family units, including deed-restricted units, condos, and apartments, have increased. Deed-restricted units represent affordable housing that can be purchased by long-term residents at below market rates. The Town and County implemented an affordable housing program in 1989. Currently there are 300 affordable units and 200 planned. The cost of housing in the project area is shown in *Table 3.11-4*. Short-term visitor accommodations have not increased at the same rate as long-term residences. The Telluride region is estimated to have over 6,000 short-term pillows by the end of 1999 (USDA 1998b). Short-term housing is generally expensive during the peak seasons (winter and summer), with average room rentals ranging from $120 per night to over $1,000 per night.

From 1992 to 1996, building permits and sales for single family and multi-family dwellings continued to increase in Montrose County. The City of Montrose approved 440 single family and 46 multi-family building permits during this time period (USDA 1998b). Outlying counties (Montrose and Ouray) and communities provide housing for seasonal

workers in Telluride. Short-term accommodations and rental units are available in Ridgway, Montrose, Norwood and Rico. *Table 3.11-4* shows an approximate number of motel rooms and room prices for the project area.

Between 1994 and 1997, the average price of residential real estate generally increased throughout the project area. Fluctuations in price existed throughout the project area. Generally, average prices in the Telluride region ($489,374) were at a minimum, over 290 percent higher than prices in Norwood or Montrose. Mountain Village single family units ($1,231,212) were 151 percent higher than the Telluride region average sales price. *Table 3.11-4* shows average residential sales prices throughout the project area. Average rents for one to three bedroom apartments, condos, or single-family homes were estimated between $750 and $3,500 in the Telluride region (Nerlin 1999: pers. comm.), between $450 and $700 in Montrose, and $450 and $1,200 in Ridgway. A 100-unit apartment complex was recently built in Ridgway to accommodate seasonal workers at the Telluride Ski Area and in Ouray County.

Table 3.11-4
Housing Statistics

Average Residential Sales Price	1994	1995	1996	1997	% Increase
Telluride	$610,000	$804,480	$758,643	$624,550	2.4
Telluride Area	$589,500	$292,250	$584,765	$489,374	(17.0)
Mountain Village	$972,860	$1,597,000	$882,640	$1,231,212	26.6
Norwood and Other	$98,825	$136,670	$131,500	$125,416	26.9
Nucla & Naturita	$57,563	$47,772	$44,315	$86,339	50.0
Montrose	$85,648	$95,928	$98,846	$106,047	23.8
Motel Accommodations	**Rooms**	**Pillows**	**Rates**		
Telluride Area		6,000+	$120+		
Ridgway	78+		$40-70		
Norwood	56+		$38-50		
Nucla/Naturita	70		$25-45		
Montrose	645		$40+		

Source: Region 10 Review, Personal communications, Montrose Chamber of Commerce

LAND VALUES

Land values in the area have increased along with housing prices, particularly in proximity to Telluride and Mountain Village. Land and residential property values near Nucla and the western part of the project area are the lowest in value within the project area. Mesa land values vary depending on irrigation rights. Market values increase upwards to 2,500 percent from Nucla to Telluride.

A residential lot in the western end of the project area, with no utilities, can be obtained for as little as $10,000. A similar lot in Placerville will be near $30,000. Real estate agents list Telluride lots from a low of $175,000 to a high of $5 million. Mountain Village lots range from $215,000 to $925,000. Regional lots list from $159,000 to $1.54 million (Shaw & Company 1999).

Land north of Sawpit on Hastings Mesa with no utilities can be obtained for under $10,000 per acre. Similar plots eight miles south on Wilson Mesa, with no utilities, will sell for over $14,400 per acre. Irrigated lands on the mesas in the western portion of the project area are

selling for $2,000 to $3,000 per acre. A non-irrigated acre will sell for $1,000 to $1,500 (Eaglewood Properties 1999). These values again climb dramatically the closer the land is to Telluride. One acre of mesa land near Telluride may sell for $35,000 per acre, although $9,000 and $15,000 per acre values are more common (Andrews 1999: pers. comm.). *Table 3.11-5* shows a sampling of land values within the project area.

Ranch properties are extremely variable, with 35- to 100-acre parcels selling between $72,000 and $1.92 million. Ranches larger than 100 and under 5,000 acres range from $249,000 to $15.47 million.

Real estate agents in the area have noted a decline in mesa property values to less than four percent increase. Regional values as a whole have grown nearly five percent, with increases in the last year of 31 percent and 37 percent in Telluride and Mountain Village, respectively (Shaw & Company 1999). The 'Down Valley' region to the west of Telluride is slower to change and buyers have a better chance of finding affordable land. Many lots in Telluride and Mountain Village are purchased by out-of-region individuals who are absentee owners.

Table 3.11-5
Sample Land Values in Project Area

Lot Location	Acres	Price	Price/Acre
Mountain Village	1.87	$525,000	$280,749
	1.0	$179,000	$179,000
Last Dollar Road	35	$1,500,000	$42,857
Telluride	8	$275,000	$34,375
	0.75	$337,680	$450,240
	0.1	$225,000	$2,250,000
Hastings Mesa	40	$399,000	$9,975
Wilson Mesa	102	$1,475,000	$14,460
Horsefly Mesa	40	$105,500	$2,638

Source: Eaglewood Properties, Andrews Real Estate, Shaw & Company

COMMUNITY FACILITIES AND SERVICES

The following section gives a brief description of facilities and services provided throughout the project area. Adequacy of services for the existing populations is noted.

Law Enforcement Law enforcement in Telluride and San Miguel County is provided by the Telluride Marshall's Office and the San Miguel County Sheriff's Office. The Sheriff's Office (including jail) has 18 staff members (Cribari 1999: pers. comm.). The Telluride Marshall's Office employs ten officers and four staff members. Five officers patrol in Mountain Village. Placerville is patrolled by the San Miguel County Sheriff's Office. Norwood has one officer within the city limits (Koon 1999: pers. comm.). Nucla has one Marshall and will be hiring a second. Law enforcement resources are generally perceived as adequate for the project area.

Emergency Services Fire protection and ambulance service in San Miguel County is provided by the fire districts of Telluride, Norwood, and Egnar/Slick Rock. The majority of emergency calls in Telluride are directed to the Telluride Fire District. The district has two fire departments and one substation. The district employs four permanent staff and operates with 54 fire fighter volunteers and 40 Emergency Medical Technicians (EMT). The district covers the eastern third of San Miguel County. The boundaries are the county line to the north, Gurley Reservoir on the south and Oak Hill Substation on the east (USDA 1998b).

The Norwood fire district covers Wrights Mesa and has 22 volunteers and two EMTs. Nucla and Naturita have a shared district and back up each other. Forty volunteers, 13 EMTs, and 10 first responders support the district (USDA 1998b).

Most medical emergencies are handled at the Telluride Medical Center in Telluride, but some patients are driven or flown to Montrose Memorial Hospital. Montrose Memorial Hospital provides major medical services for the area. Emergency and medical services in the project area are viewed as adequate for the current needs in the rural environment of San Miguel and Montrose County.

Social Services The San Miguel County Department of Social Services employs four people. Services provided include food stamps, Aid to Dependent Children (ADC), programs for mentally and physically challenged individuals, aid to the elderly, and others.

While social services are currently viewed as adequate they are among the first sectors of public services to be impacted by population growth.

Utilities The San Miguel Power Association (SMPA), a cooperative member of Tri-State Generation and Transmission Association, serves six Colorado counties including San Miguel and portions of Montrose. SMPA provides service to 9,328 customers (a population base of 18,732) across 3,800 square miles of southwestern Colorado. A description of the current power provided to the area is included in Section 1.3, Purpose and Need. In 1997, peak demands for energy were 22.2 MW in summer and 30.1 MW in winter. Overall capacity of the system is dependent on a number of factors, which are described in more detail in Section 1.3. With reliability criteria of .95/unit voltage, which connotes a safety factor, the capacity of the Telluride/Cascade 115 kV Transmission Line is between 20 and 25 MW.

Demands for power have increased over the years with an annual energy growth rate of 1.6 percent in the past 23 years (Tri-State 1999). In 1997, residential use made up 79 percent of the total retail accounts and was responsible for 79 percent of the total retail electric sales. Residential accounts have increased at an average growth rate of 3.4 percent annually over a 15-year period; residential energy has increased at an annual average growth rate of 4.0 percent over the same period. Small commercial accounts made up 20 percent of all retail accounts in 1997 and were responsible for 37 percent of total retail sales. Residential accounts are predicted to increase at an annual growth rate of 1.9 percent into the future. Small commercial accounts have increased at an average annual growth rate of 5.9 percent in the past five years and are expected to increase at an annual growth rate of 1.7 percent over the next 20 years.

San Miguel Power Association projects peak summer demand at 28.3 MW for 2010 and winter demand at 38.1 MW, which is a 2.2 percent annual average increase in summer energy peak demand, and a 1.8 percent annual average increase in winter peak demand over the next 10 years. During the same period, average annual population projections for the San Miguel Power Association service area are estimated at 2.0 percent. These projections are lower than the current average annual growth rates and recent historical growth rates.

Water supply is adequate for the Telluride region. The Town of Telluride recently acquired new water rights that doubled available capacity (USDA 1996). Two water treatment facilities operate in the area (Goldsworthy 1999: pers. comm.). Peak demand for both plants is estimated at two million gallons a day (MGD). Norwood has 1,500 customers and adequate supply (Lippert 1999: pers. comm.). Nucla and Naturita both have excess capacity.

A new wastewater treatment facility will be constructed in the summer of 2001 in Telluride. The new facility will relieve the current capacity constraints of the existing

system, which is frequently operating over 100 percent of capacity (Goldsworthy 1999: pers. comm.). The wastewater system serves the Town of Telluride and Mountain Village. The Norwood wastewater facility is operating at 80 percent of capacity. Expansion of the plant will occur in the near future (Lippert 1999: pers. comm.). Both Nucla and Naturita have excess capacity.

Solid waste is handled by two contractors. Both haul to the landfill in Nucla.

Road Maintenance and Snow Removal San Miguel and Montrose Counties and the State of Colorado are responsible for maintenance of county and state roads. Road maintenance and snow removal in the Telluride region is done through the combined efforts of the Telluride Town Council, Mountain Village, and the Telluride Ski Area. Road maintenance and snow removal are provided by the Colorado Department of Transportation (CDOT) on State Highway 145. These services appear to be adequate. In the near future, road improvements are planned for Highway 145 at the intersection of Highway 145 and the South Fork Road, west of Society Turn. More information on road conditions on Highway 145 is available in Section 3.12, Transportation.

Education The Telluride School District and Norwood School District serve the needs of over 800 students in San Miguel County (Region 10 Review 1997). The Telluride School District completed construction of a new middle school/high school in 1995. The student/teacher ratio of about 20:1 is relatively low compared to national averages. The Telluride and Norwood schools have been growing at rates (3.7 and 2.8 percent, respectively) well below the population growth rate (Region 10 Review 1997), suggesting fewer households with children.

In Montrose County, two school districts serve over 5,500 students. The student/teacher ratio is 19:1 in the districts. School enrollment in Montrose County has also grown at a slower rate (2.6 percent) than the population growth rate (3.9 percent).

Adequate capacity exists in all school districts within the project area.

TAX BASE AND TAX REVENUE

The Colorado sales tax is currently three percent on the sale, purchase, use, or consumption of tangible personal property. Transient lodging and meals are also subject to sales tax.

Retail sales in San Miguel County in 1997 were $153.6 million. Telluride is the dominant trade center in San Miguel County accounting for 67 percent of all retail sales, followed by Mountain Village, 12 percent, and Norwood, five percent. The Town of Telluride has an eight percent sales tax on all tangibles; four percent goes to the City, one percent to San Miguel County, and three percent to the State of Colorado. Retail sales within the project area continue to increase rapidly due to large increases in sales in the Telluride region. From 1996 to 1997 retail sales increased by 10 percent in Telluride and declined by four percent in Norwood. The 1997 per capita retail sales in San Miguel County were $27,145, which was 1.4 times the state average. Telluride per capita sales were $52,715 in 1997, which was 2.7 times the state average (Region 10 Review 1998). Skier or other tourist expenditures are estimated to represent a large percentage of overall sales. In addition, indirect benefits accrue to businesses throughout the community. These direct expenditures induce additional "indirect" expenditures (*i.e.*, purchases of labor and inputs by those businesses selling directly to visitors).

Retail sales in Montrose County amounted to $483.9 million in 1997. Retail sales increased by 4.1 percent from 1996 to 1997 with the majority of sales occurring in Montrose, the ma-

jor trade center in the area. Retail sales in Nucla and Naturita increased, also. Average per capita retail sales in Montrose County was $15,780, 20 percent less than the state average.

Property taxes in San Miguel and Montrose Counties are levied by the schools, the cities, the county, and special districts. Various classes of property are assessed at different rates. Residential property is assessed at 9.74 percent and all other property is assessed at 29 percent. The counties' tax rates and mill levies vary according to the tax area. The mill levies in some of the taxing districts in the area are in the following ranges: 42.208 in Telluride, 81.335 in Norwood, 35.167 in Placerville, 34.826 in Sawpit, 76.546 in Redvale, and 81.434 to 95.207 in Nucla (Watt 1999: pers. comm.). The assessed 1997 taxes paid by San Miguel Power Association in 1998 were $61,816 in San Miguel County, and $52,937 in Montrose County. Tri-State paid $1.5 million (which includes the Nucla Generating Plant and all other facilities in Montrose County) in taxes in Montrose County for 1997 (paid in 1998), and $34,415 in San Miguel County (Montrose and San Miguel County Treasurers' Offices, 1999).

The 1993 through 1997 assessed valuations for San Miguel and Montrose Counties are shown in *Table 3.11-6*. Assessed valuation has increased by 50 percent in San Miguel County and 30 percent in Montrose County over the period.

ENVIRONMENTAL JUSTICE

Under Executive Order 12898 (published in the Federal Register on February 11, 1994), federal agencies are required to identify and address disproportionately high or adverse human health or environmental effects of their programs, policies, and activities on minority populations and low income populations. Within the area potentially affected by the proposed Project, no minority populations are affected. The existing 69 kV transmission line currently runs through several residential areas, which would be considered low to moderate income, near Norwood and Redvale, and several areas which would be considered high income on Specie and Wilson Mesas. During the EIS process, particular efforts were made to ensure that property owners within the affected areas were informed of the proposed Project and the EIS procedures, and given the opportunity to provide comments.

Table 3.11-6
Assessed Valuation (millions of $)

	1994	1995	1996	1997	% Increase
San Miguel County	242.5	290.4	298.0	329.9	36.0
Montrose County	169.7	190.1	198.5	221.5	30.5

Source: Region 10 Review

Income levels throughout the project area are diverse. The most recent estimate of median household income was in 1989 and shows a range of $19,688 in Naturita to $37,500 in Sawpit. These numbers reflect the disparity of incomes, moving from lower incomes in the western portion of the project area to higher incomes closer to Telluride. The most recent poverty status statistics are also from the 1990 census data and may not reflect the current conditions; however, this data showed poverty status for 13.3 percent (1,290) of the population in Telluride, 0 percent (31) in Sawpit, 14.3 percent (427) in Norwood, and 11.3 percent (655) in Nucla (US Bureau of the Census 1990). Since the economic base of the western portion of the project area is largely rural agriculture and the eastern portion is tourism, low-income areas are dispersed within the project area.

3.11.2 ENVIRONMENTAL CONSEQUENCES

3.11.2.1 ANALYTICAL FRAMEWORK

POTENTIAL TYPES OF IMPACT

CONSTRUCTION AND OPERATION IMPACTS

Socioeconomic impacts of the Project may be divided into direct and indirect impacts. Direct impacts result from the construction of the Project and consist of fiscal impacts from the construction and related expenditures, increased short-term employment and income, and impacts on the local housing market due to temporary housing of construction labor. Direct Project effects during operations include the potential impacts on property values and electricity rates. Indirect effects include the potential impacts to social values. Many local residents are opposed to the use of fossil fuels for electrical generation because of the issues of pollution and efficiency. Alternative, non-polluting sources of energy, or conservation, would be preferred by many area residents. Other indirect impacts include growth-inducing impacts related to the increased reliability and increased capacity of the electrical system in the SMPA region.

Generally, socioeconomic impacts are associated with the entirety of the Project; therefore, impacts from the transmission alternatives that are related to population, employment, income, housing, financial, or growth-induced elements would not change dramatically among the alternatives. However, the alternative locations would affect property values and social values differently. Similarly, differences in impacts exist between the overhead and underground technologies. Differences in impacts among project components or alternatives are identified where there are discernible differences.

DEFINITION OF SOCIOECONOMIC IMPACT LEVELS

High Impacts Socioeconomic impacts will be characterized as high in the following situations:

- If changes in social well-being result in lasting changes to lifestyles or social behaviors.
- Demand for temporary housing exceeds the existing supply when project-related needs are combined with recent occupancy rates during the scheduled construction season.
- Permanent demand on other infrastructure is greater than 10 percent of the current level of demand; construction and/or operations demand exhausts the carrying capacity in areas where workforce would live.
- Change in local tax bases of greater than 10 percent (positive).
- The change in area population is 10 percent or more.
- Long-term employment increases of more than 10 percent for the project area (positive).
- Property values may be impacted to a significant degree from transmission line location within 50 to 300 feet of property due to key scenic views being altered.

Moderate Impacts Socioeconomic impacts will be characterized as moderate in the following situations:

- Increased indirect expenditures, in the short term, within the project area (positive).
- An increase in electrical rates of more than five percent.
- Increased sales and property tax generation (positive).

- Property values within the corridor may be impacted. Impacts may range from high to low depending on unique conditions and property scenic views and presence of other lines and cultural features.
- Social concerns exist and are represented in a local forum.

Low Impacts Socioeconomic impacts will be characterized as low in the following situations:

- Properties may be slightly affected by the transmission line in the background, where some scenic views are altered and the presence of the line is evident.
- Temporary tourist housing accommodations are impacted by construction workers.

Applicable Permits, Standards and Ordinances

No permits or authorizations are exclusively associated with socioeconomic impacts described in this section.

Environmental Protection Measures

In order to minimize the potential socioeconomic impacts in the project area, the following Environmental Protection Measures (EPM) would be implemented for the proposed Project and the alternatives: *Table 2.2-4* Tri-State Standard Mitigation Measures, numbers 41 and 43.

These EPMs have been taken into consideration in assessing impacts on public and private lands.

3.11.2.2 IMPACTS COMMON AMONG THE TRANSMISSION ALTERNATIVES

Direct and Indirect Impacts

This section evaluates the effects of the Proposed Action and alternatives within the context of social and economic changes in the affected area. Major construction of the proposed Project is scheduled to begin in August, 2003 and continue until completion in December, 2004. Peak employment would occur in August, 2004. The work schedule would generally be higher in the summer and fall months and decline during the winter months. The actual construction and operations schedule would depend on completion of the permitting process.

Calculations of impacts were based on known characteristics of the affected area and supported by professional planning standards.

Social Concerns

As mentioned in the Affected Environment Section, 3.11.1, growth, development, and maintenance of the quality of life issues predominate the social scene in the Telluride area. The spectrum of social issues area-wide include the disparity of income within the region. Nucla has a depressed economic base compared to Telluride, Norwood is becoming a bedroom community for the service employees in Telluride, and more and more second home buyers are purchasing land or homes, thus affecting housing affordability even in Norwood and further west.

Scoping comments documented the social concerns about the proposed transmission line for the population within the project area. The concerns cited include scenic impacts to pristine vistas, the San Miguel River Canyon, Naturita Canyon, and other recreational use areas; preservation of the environmental (biological) integrity of the area; human health effects from electromagnetic fields (EMFs); livelihood and safety impacts related to power

outages; residential effects (visual and property values); and purpose and need for the line, as related to alternative energy options and conservation.

The primary social concerns for the proposed Project are related to reliable power supply, visual conditions, property values, and several energy related issues. The specific issues cited include the following: 1) the visual impact on residential and backcountry views, 2) the impact of the line on property values within proximity of the right-of-way, 3) the lack of an energy code or energy policy for San Miguel County, 4) the lack of energy conservation (conspicuous use of energy in Telluride), 5) pricing policies related to energy consumption, 6) limited expansion of alternative, renewable sources of energy, 7) the continued burning of fossil fuels in power plants which emit toxic substances to the environment and are not energy efficient, and 8) life and safety concerns if a lack of reliable power continues. Many of these issues are evaluated for the transmission alternatives in other sections of the EIS. The reader is referred to Section 3.6 Biological Resources, 3.8 Land Use, 3.9 Recreation, 3.10 Visual Resources and 3.14 Human Health and Safety for additional information. Reference should also be made to Chapter 2.0 for further information on distributed generation energy options and fossil fuel use associated with the proposed Project. Issues that are not within the scope of this EIS include local energy codes, energy consumption patterns, and alternative pricing options. These issues are being addressed at the local county level by the San Miguel Energy Research Group (SMERG).

The SMERG has been meeting since the fall of 1998 to accomplish the task set forth in their mandate described in the Social Concerns segment of the Affected Environment Section: Is there a cost-effective alternative to a new powerline? The group is comprised of 20 members representing various interests throughout the project area. The committee has held numerous meetings to discuss the pertinent issues and has invited guest lecturers to talk about alternative energy sources and economic viability, including distributive generation, cogeneration (Dish Sterling), Anaerobic Sewer Digestion, XONON combustion technology, hydroelectric, solar, wind, fuel cells, energy conservation, and implementation of energy policies/codes. SMERG has completed data gathering and research. SMERG plans on reviewing the Tri-State Special Use application and Forest Service Draft EIS prior to preparing a report with recommendations about approval or denial of the transmission line permit to the Board of County Commissioners (Perrin *et al.* 1999: pers. comm.). SMERG will proceed with the long-term mission of assessing potential energy conservation, drafting an energy policy, and quantifying future energy requirements with and without an energy policy once the powerline issue has been decided. It is hopeful that the group will continue into the future (Goodtimes 1999: pers. comm.).

This EIS provides information regarding whether distributed generation technologies can provide a cost-effective alternative to the proposed powerline. The overall costs, reliability and environmental tradeoffs of distributed generation options are compared with the transmission alternatives in the various impact sections of this EIS. Chapter 2.0 provides a comparison of the costs and reliability issues for these technologies. Chapter 3.0 addresses the major environmental tradeoffs for the distributed generation alternatives, including Air Quality (Section 3.2), Visual (Section 3.10) and Noise (3.13). Issues further evaluated in the Socioeconomic section are the short-term impacts of project construction, the potential for long-term impacts on land values and the implications of reliable power to the local communities and their economies.

Population and Demographics

Construction The proposed Nucla-Telluride Transmission Line Project is expected to have an average construction workforce of 40 people, with a peak workforce of 74 in August, 2002. First year construction workforce would range from 9 to 25 workers. During the peak

construction period, June through September, 2002, summer employment would range between 28 and 74. The construction workforce schedule for each alternative for the 14-month construction period is shown in *Table 3.11-7*. The greatest population and employment impact on the project area would occur at peak construction periods.

The effect of construction on area population depends largely on the number of in-migrating workers. It is anticipated that 70 percent of the construction workforce would be non-local (Mundorff 1998: pers. comm.). Population estimates for peak employment levels are based on a local direct or commuting workforce of approximately 22 people (30 percent of the peak workforce). This local workforce would commute to and from their places of residence on a daily basis and, therefore, not affect growth in the overall population of the area. These workers could come from labor forces in Montrose, San Miguel and Ouray Counties.

Table 3.11-7
Construction Workforce by Month

Month/Year	Nucla-Norwood Northern	Nucla-Norwood Central	Nucla-Norwood Southern	Norwood-Sunshine	Norwood-Telluride
2003					
August	9	9	9		
September	14-19	14-19	14-19		
October	18-25	18-25	18-25		
November	18-25	18-25	18-25		
December	9-16	9-16	9-16		
2004					
February	6	6	6		
March	15	15	15		
April	17	17	17		
May	23-28	23-28	23-28		
June				28-31	28-36
July				33-59	33-56
August				47-70	51-74
September				43-66	34-57
October				16-33	16-33
November				28-33	28-33
December				12	12

Source: Tri-State Generation and Transmission Association

The non-local peak direct workforce is based on an estimated 52 people (70 percent of the total workforce), who would temporarily relocate to the area during construction activities. (Mundorff 1998: pers. comm.). Because of the short construction period for each spread and the limited affordable housing in the area, it is anticipated that few workers would bring their families. Those workers who bring their families could find temporary housing in Nucla, Norwood and Montrose.

Due to the nature and short term of the construction project, minimal indirect employment would be created.

The majority of the construction-related population is expected to locate in the Nucla, Norwood, Ridgway and Montrose areas. Adequate temporary accommodations exist within commuting distance of the project alternatives.

Impacts to the project area population are not anticipated during construction.

Operations The existing maintenance workforce in Montrose would maintain the new line. No additional employment or population impacts would occur upon construction completion.

ECONOMY AND EMPLOYMENT

Construction According to Tri-State, the purpose of the proposed Project would be to improve electrical reliability in the region, improve regional operating efficiency, and improve quality of service. The economic effect of completing the Project would be to ensure that there is sufficient and reliable electrical power available to sustain the existing and growing population in the San Miguel and Montrose County areas. In Telluride, in the past five years, electrical demand has grown at an annual rate of 3.4 percent for residential customers, and 3.9 percent for commercial customers (Tri-State 1999). Additional revenues from property taxes would accrue to San Miguel and Montrose Counties. During the construction phase short-term employment would be generated. The increase in employment would not be considered a moderate or high positive impact since construction employment is not permanent.

Income related to construction activities would total $2.625 million for the 2-year construction period. This income would be dispersed to workers in San Miguel, Montrose and Ouray Counties with an estimated $950,000 expended the first year of construction, and another $1.7 million the second year. Wage rates range from $12 to $22 per hour, depending on skill levels.

Estimated expenditures in the local area include $250,000 for gas, diesel fuel, and miscellaneous supplies and repairs during the construction period. In addition construction workers would spend money in the local economies. This spending would be considered a moderate, positive impact to the local economy during the 2-year construction period.

Assuming 85 to 90 percent (U.S. Department of Labor 1993) of these wages represents disposable income and a local spending (San Miguel, Montrose and Ouray Counties) capture rate of 40 percent for construction employees, a total of $890,000 in new local spending for goods and services would occur during project construction within the service area. Local businesses in Nucla, Norwood, Telluride, Ridgway, Montrose and surrounding towns would benefit from this local spending.

Income in the area during operations would remain relatively stable since no additional operations employees would be hired.

Operations The existing maintenance workforce in Montrose would maintain the new line. No additional employment would occur upon construction completion. Income in the area during operations would remain relatively stable since no additional operations employees would be hired. No direct impact to employment or the economy is anticipated from the proposed Project during operations since no permanent employment or income increases would occur.

HOUSING

Construction Demand for housing would be derived from the estimated 52 peak temporary construction workers moving to the area during construction activities. As described in the Affected Environment Section, the existing permanent rental housing market is generally tight due to the influx of workers from outside the county looking for affordable housing during the tourist season. However, housing for the construction workers should not represent a significant short-term problem to the local area. An abundance of available temporary units can be found within commuting distance of the project area and the low

number of temporary workers should not put excessive demand on the temporary housing market. A low impact on temporary tourist housing could occur during peak months of project construction.

Operations No impact from the proposed Project is anticipated since demand for permanent housing would not occur.

Property Values

Operations The impact on the value of properties within proximity to the transmission line is one of the key socioeconomic issues to be analyzed. For this analysis, properties within the alignment right-of-way, 300 feet from the alignment, and transmission line corridor have been identified and are shown in the tables under each alternative. These tables also identify the potential impacts to property values for each alternative. The impacts identified are *potential* impacts based on research and discussions with local real estate representatives. The impacts are generally related to the distance from the right-of-way and transmission line corridor. However, each property identified on the table is unique, and may have characteristics which mitigate the potential effects related to the proximity of the proposed transmission line. Conversely, properties outside the transmission line corridor could potentially experience impacts to property values.

In determining the impacts to property values from the transmission line in Montrose and San Miguel Counties, several levels of analysis were utilized: 1) an extensive literature search on studies related to the impact of High Voltage Transmission Lines on residential properties was completed, and 2) local real estate representatives (realtors, consultants, and appraisers) were contacted to determine the local perspective on the potential effect of the line on various rural properties. Some properties potentially affected by the proposed upgrade were examined on field trips in both the winter and spring of 1999, and 3) recent and historic sales data was collected from the county assessor's office. Parcels with routed transmission lines were compared to those without transmission lines.

There are two aspects of the proposed transmission line upgrade that would potentially impact property values: visual encumbrances, and health and safety effects. Through literature review, the more significant of the two is the visual effects. EMF-induced health hazards have not statistically proven to have a significant effect on property values (Kinnard et al 1997). To date research on the impacts of EMFs to human health have been contradictory. Conclusions about the negative effects of exposure to EMFs from high voltage transmission lines have not been substantiated by all researchers to date (See Section 3.14, Human Health and Safety).

Most of the research reviewed on the impact of transmission lines on property values focused on urban environments. The studies reviewed included assessments of various types of high voltage transmission lines including a 138 kV, 230 kV, 315 kV, and a 345 kV. Most of the research was completed for subdivisions in urban settings, including medium and higher income housing developments. The overall conclusion for all of the studies reviewed was that properties located adjacent to or within 325 feet of the transmission line would experience some property value impacts. In all studies, the transmission line tower was typically a four-legged steel tower or a tower on a pylon; more detracting visually than a single wood pole with conductors. In all studies, the results suggested, that the initial impact from the line would be the greatest; after a period of time the transmission line would become a part of the landscape and have less of an impact on property values (Hamilton et al 1995). Another common conclusion was that no impact to property values occurred after a certain distance (between 200 and 325 feet), because the negative visual impacts diminished rapidly. In some cases, homes located along the easement typically had larger yards to compensate for the adjacent transmission line. Sometimes, these homes

had more open space surrounding the home, providing more privacy and an enlarged visual field. These properties were actually valued higher than other properties not visually encumbered by the transmission line.

The resulting quantitative impact to property values was difficult to generalize in the studies. The range of impacts varied from a positive impact, to a 20 percent decline in value. The range most commonly identified for properties located within 165 to 325 feet of the alignment was, on average, a decrease of 5 to 10 percent in overall mean house value. Again these studies were conducted in urban settings, generally in higher density subdivisions where steel lattice structures were built. No impact research was found on rural properties with single or H-frame wood poles.

Local real estate representatives were also contacted to get their perspective on the local effect of transmission lines on adjacent properties. Most realtors, with properties listed adjacent to or within close proximity of the existing line, feel that property values would be significantly affected. One realtor cited a decrease in the range of $2,000 to 5,000 per acre (Cieciuch 1999: pers. comm.). The visual impact is regarded as the major impact on property values. Several realtors suggested that current properties they have listed have not sold because of their proximity to powerlines (Fadorka, Smith 1999: pers. comm.). According to local realtors, it is difficult to sell properties within view of a transmission line. The length of time necessary to sell a property visually encumbered by a transmission line is usually significantly longer. A smaller niche of potential buyers exists for properties with transmission lines nearby (Smith 1999: pers. comm.). Properties never impacted by a transmission line would be, perceptually, more impacted than properties already affected by a view of a line from the standpoint of sales price (Smith 1999: pers. comm.). The impact to some Wilson Mesa properties would be greatest because homesites are situated along a ridge, higher than the existing 69 kV line. If the line is raised, the views from these homes would be impacted (Cieciuch 1999: pers. comm.).

Several real estate consultant/appraisers were also contacted about the effect of the transmission line on property values. It was generally agreed that the effect on property values depends on many factors including whether the property (homesite) faces the line or whether the line is located behind the homesite, whether the location of the line detracts from the views of the property or use of the property (agriculture), what natural vegetation or topography buffers the impact, how far away the line is located, the size of the parcel affected, whether the property is residential or agricultural, etc. The actual impact on property values would depend on the characteristics of each individual property, but it is generally agreed that some impact to value would occur and/or the property would take longer to sell.

Platted residential areas that would potentially be crossed by the transmission line upgrade include Norwood Garden Estates, Pioneer Village, Timberline View Subdivision, La Mesa Subdivision, Hillside Development (Fitts Sub), Beaver Pines, Great American Ranch, the Peninsula, Top of the World Ranch, Specie Mesa Ranch, Wilson Mesa Ranch, and Ptarmigan Ranch. Other properties not in planned developments or subdivisions would also be affected.

The last piece of research completed included collection of sales data for Wilson Mesa, Ptarmigan Ranch, Specie Wilderness, Elk Creek Land Company, Sunshine Mesa, Alta Lakes, and Ilium Valley. The intent of this analysis was to determine if variations in sales price existed between properties with or without a transmission line placement. This research was inconclusive due to the high variability of other aspects of a particular property. Access, utility availability, views, distance from town, covenants, location, water, size, and market conditions all affect the price of land. Over the past five years,

demand for rural properties has fluctuated. In 1999, real estate agents noted a decline of under 4 percent in price of mesa properties surrounding Telluride. In reviewing sales data it was difficult to compare sales price without actually viewing the properties to define similarities or dissimilarities and other property characteristics. However, the asking price of property resales at Ptarmigan Ranch, with a powerline running behind the homesite, appears to be the same as properties without the transmission line.

For this analysis, properties within the project area do not necessarily resemble typical urban subdivisions, therefore an impact factor cannot be applied across the board. It is assumed that some property values would likely be impacted by the utility line; the level of impact would vary depending on property characteristics. The properties most likely to be impacted would be located within the right-of-way or within 300 feet of the line, although some properties outside these boundaries could also experience negative impacts due to visual impacts from altered scenic views. Potential property value impacts within the project area could be high, moderate or low.

Properties along the existing route (Nucla-Norwood Northern Alternative and Norwood-Sunshine Alternative) are already impacted by the 69 kV line. The impact of the proposed transmission line, 30 to 40 feet higher, is difficult to assess for these properties depending on property characteristics such as homesite location, vegetation, topographic characteristics, etc. of the area. Fewer residential properties are impacted along the Nucla-Norwood Central and Southern Alternatives; however, some of these properties would be visually impacted for the first time. The Norwood-Telluride Alternative would affect fewer properties, but would have high visual effects on scenic areas enjoyed by the local and visitor populations. Finally, in comparison, the underground subalternative would substantially avoid the potential impacts to land values by undergrounding the transmission line across scenic areas of Specie, Wilson and Sunshine Mesas. This subalternative is discussed further in Section 3.11.2.4.

Community Services and Facilities

Law Enforcement and Emergency Services Significant impacts to public safety services are not anticipated from the proposed Project, although the Sheriff's department may experience some short-term impacts such as increased traffic and traffic infractions problems during construction. Public Safety services including police, sheriff, ambulance, and fire are adequate for the projected construction population.

Social Services The social services in San Miguel and Montrose Counties and communities could adequately accommodate the projected population during construction.

Utilities All public utilities including water and sewer, sewage treatment, solid waste, and telephone service are adequate within most of the area and would be adequate to serve the short-term construction population. With the new transmission line, regional electrical reliability, quality of service, and operating efficiency would be improved. No electric rate changes are anticipated with the new line (Mundorff 1999: pers. comm.). No impact from the Project is anticipated due to increases in electrical rates.

Road Maintenance and Snow Removal Construction activities would occur primarily during the spring, summer, and fall when snow conditions on roads are low or non-existent. During construction, the construction contractor would be responsible for signing and traffic control according to county permit guidelines. No major road maintenance issues are anticipated during construction or operation of the Project. Transportation issues are described in more detail in Section 3.12.

Education All public school systems within the project area have adequate capacity to serve the few (if any) in-migrating families requiring school services for the short-term construction period.

During construction, minimal impact to local government facilities and services is anticipated from increased population related to the construction workforce.

It is not anticipated that the proposed Project would have low, moderate or high impacts on community facilities or services during the construction or operations phases. Adequate carrying capacity exists in all community services except electrical power.

Public Finance The proposed Project would have a net beneficial impact on the fiscal conditions of San Miguel and Montrose Counties and the State of Colorado throughout most of the life of the Project. Revenue increases would result primarily from greater property tax revenue through the life of the line. The construction of the line would also generate sales and use tax to the state and local governments. Estimated expenditure figures for local or regional supplies such as diesel fuel, gasoline, and miscellaneous supplies and repairs is estimated to total approximately $250,000. This would be considered a positive impact. During construction, the surrounding communities of Nucla, Norwood, Telluride, Ridgway and Montrose may also benefit from increased sales tax receipts from construction workers expending money in the local economy, and from local purchases by Tri-State, SMPA, and the transmission line contractor.

The principal revenue change for the county would result from an increase in assessed valuation attributable to the new transmission line, substation modifications, and new distribution lines. The maximum and minimum estimated capital expenditures for the transmission line, new substation and substation modifications, and associated distribution line costs range between approximately $12.6 million and $13.9 million, depending on which alternatives are selected (See Appendix A-1, *Table A-4-2*, Costs of Primary Alternatives by Facility Improvements). Estimates for the subalternatives are not available, but estimated total project cost is not anticipated to vary significantly.

Ad valorem tax (property tax) is estimated by applying the tax rate to the assessed valuation. Assessed valuation is equal to 29 percent of the capital investment. The average tax rate in Montrose County along the alternative routes is estimated at 72.839 for 1999. In San Miguel County, the average tax rate along the alternative routes is estimated at 60.955 for the Nucla-Norwood alternatives, 59.993 for the Norwood-Sunshine Alternative, and 60.531 for the Norwood-Telluride Alternative (Assessors' Offices 1999). Receipt of property tax revenue on operations would lag one year behind installation of improvements because of conventional assessment and collection practices. Annual property taxes would vary due to depreciation factors. The estimated maximum and minimum total property tax generated by the proposed Project at full build-out, without depreciation, is $ 241,114 and $ 217,621, respectively. *Table 3.11-8* shows the estimated first year tax revenues based on the percentage of capital expenditures by year provided by Tri-State. Of the total costs of the Primary Alternatives, 3.8 percent is anticipated to be spent in the first year, 15.6 percent the second year, 72.8 percent the third year, and 7.8 percent the fourth year (Mundorff 1999: pers. comm.).

Because utility properties are state assessed, it is difficult to estimate what revenues would be removed from the county tax rolls. The taxable value of the 69 kV line is not available from the county assessor's office. The estimated tax revenues for the proposed Project would be reduced by the tax revenue generated by the 69 kV line, which would be taken out of service. The true incremental increase in property taxes is less than the projected tax revenues shown in *Table 3.11-8*.

Table 3.11-8
Estimated First Year Tax Revenues

Alternatives	Nucla-Norwood Northern with Norwood-Sunshine	Nucla-Norwood Central with Norwood-Sunshine	Nucla-Norwood Southern with Norwood-Sunshine	Nucla-Norwood Northern with Norwood-Telluride	Nucla-Norwood Central with Norwood-Telluride	Nucla-Norwood Southern with Norwood-Telluride
San Miguel County						
Year 1	$6,102	$6,060	$6,911	$6,519	$6,517	$7,368
Year 2	$25,052	$24,879	$28,373	$26,762	$26,752	$30,246
Year 3	$116,907	$116,101	$132,406	$124,889	$124,843	$141,148
Year 4	$12,526	$12,439	$14,186	$13,381	$13,376	$15,123
Montrose County						
Year 1	$2,167	$2,646	$1,463	$2,167	$2,646	$1,463
Year 2	$8,897	$10,862	$6,005	$8,897	$10,862	$6,005
Year 3	$41,521	$50,687	$28,023	$41,521	$50,687	$28,023
Year 4	$4,449	$5,431	$3,002	$4,449	$5,431	$3,002
Total Tax Revenue at Full Build-Out without depreciation						
San Miguel County	$160,587	$159,479	$181,876	$171,551	$171,488	$193,885
Montrose County	$57,034	$69,626	$38,493	$57,034	$69,626	$36,493
Total Property Tax	$217,621	$229,105	$220,369	$228,585	$241,114	$230,378

Source for Information: Colorado Division of Property Taxation, Montrose and San Miguel Assessors, Tri -State Generation and Transmission Association

Environmental Justice Neither low income (poverty status) nor minority populations would be disproportionately impacted by any of the proposed alternatives or subalternatives. As described in the Environmental Justice Section of the Affected Environment, the economic base of the area is predominately agriculture in the western portion of the project area (Nucla to Norwood) and tourism further east to Telluride. Segments of the population are low income, particularly in the Nucla/Naturita/Redvale areas, due to the somewhat depressed economic base. However, families within the defined poverty status represent less than 14 percent (in 1989) in the area and low income properties as well as high income properties would be equally affected. The Nucla-Norwood Central and Nucla-Norwood Southern Alternatives, as well as Subalternatives B and C, are sited to impact fewer residences throughout the area from Nucla to Norwood. Lower income residential areas potentially affected by the transmission line include the Redvale area (Nucla-Norwood Northern Alternative) and the affordable housing in Ilium Valley near the Ilium Valley Business Park (Norwood-Telluride Alternative). However, higher income areas affected by the transmission line include Specie Mesa (all alternatives), and Wilson Mesa (Norwood-Sunshine Alternative). People within the poverty status may reside along the alternative routes, but not disproportionately.

The proposed action would not have a disproportionately high or adverse effect on minority and/or low-income populations or corresponding property values of minority or low-income populations.

SUMMARY

In summary, the impacts common to all the transmission system alternatives include the following: 1) social concerns about non-renewable energy use and other environmental concerns, 2) short-term increases in employment, income, and local spending from construction activity in Montrose and San Miguel Counties, 3) potential short-term low impacts on temporary housing in Montrose, San Miguel and Ouray Counties and the

surrounding communities from construction-related population, 4) moderate positive impacts from increased generation of sales, use, and property taxes from construction and operation of the upgraded transmission line, and 5) low, moderate, and high impacts on property values within the transmission line corridor.

The following sections describe the unique property value impacts related to each transmission alternative.

3.11.2.3 IMPACTS OF THE PRIMARY TRANSMISSION ALTERNATIVES

Nucla-Norwood Northern Alternative

115 kV Transmission Line Effects

Property Values

Properties within close proximity to the Nucla-Norwood Northern Alternative would experience some degree of impact to property values. Since this alternative follows the existing 69 kV line, the level of impact may be less than in areas in which no transmission line exists. Each property would be uniquely impacted depending upon location, site characteristics, vegetation, topography, and other determining factors. A total of 87 rural residential properties currently lie within the transmission line corridor, which is 1,320 feet (one-fourth mile) on either side of the alignment. Approximately 57 undeveloped lots in Montrose County and 87 undeveloped lots in San Miguel County are located within the corridor. Lot sizes range from less than 35 acres to several hundred acres.

Property values of prime farmland and irrigated farmland would also be potentially impacted by the transmission line. Approximately 2,188 acres of prime farmland are located within the corridor, of which 49 acres are located within 100 feet of the alignment. An estimated 40 acres of irrigated farmland lie within 100 feet of the alignment. Agricultural land parcels traversed by the transmission line may experience impacts to property values (see *Table 3.11-9*).

Table 3.11-9
Potential Impacts to Property Values – Nucla-Norwood Northern Alternative

(from alignment)	Land Use	# of Units / Lots	Impact Level
Within 50 feet	Rural Residential	5 / 34	Potentially Moderate to High
Between 50 and 300 Feet	Rural Residential	16 / NA	Potentially Moderate to High
Between 300 and 1,320 feet	Rural Residential	66 / 110	Moderate

Source: Geo/Graphics
N/A – Not Available

Nucla-Norwood Central Alternative

115 kV Transmission Line Effects

Property Values

Properties within proximity to the Nucla-Norwood Central Alternative would experience some degree of impact to property values. Each property would be uniquely impacted depending upon location, site characteristics, vegetation, topography, and other determin-

ing factors. A total of 36 rural residential properties currently lie within the transmission line corridor, which is 1,320 feet (one-fourth mile) on either side of the alignment. Approximately eight undeveloped lots in Montrose County and 89 undeveloped lots in San Miguel County are located within the corridor.

Property values of prime farmland and irrigated farmland would also be potentially impacted by the transmission line. Approximately 1,921 acres of prime farmland are located within the corridor, of which 42 acres are located within 100 feet of the alignment. An estimated 13 acres of irrigated farmland lie within 100 feet of the alignment. Agricultural land parcels traversed by the transmission line may experience impacts to property values (see *Table 3.11-10*).

Table 3.11-10
Potential Impacts to Property Values – Nucla-Norwood Central Alternative

(from alignment)	Land Use	# of Units / Lots	Impact Level
Within 50 feet	Rural Residential	2 / 16	Potentially Moderate to High
Between 50 and 300 Feet	Rural Residential	3 / NA	Potentially Moderate to High
Between 300 and 1,320 feet	Rural Residential	31 / 81	Moderate

Source: Geo/Graphics
N/A – Not Available

Nucla-Norwood Southern Alternative

115 kV Transmission Line Effects

Property Values

Properties within proximity to the Nucla-Norwood Southern Alternative would experience some degree of impact to property values. Each property would be uniquely impacted depending upon location, site characteristics, vegetation, topography, and other determining factors. A total of 12 rural residential properties currently lie within the transmission line corridor which is 1,320 feet (one-fourth mile) on either side of the alignment. Approximately six undeveloped lots in Montrose County and 16 undeveloped lots in San Miguel County are located within the corridor.

Property values of prime farmland and irrigated farmland would also be potentially impacted by the transmission line. Approximately 1,466 acres of prime farmland are located within the corridor, of which 49 acres are located within 100 feet of the alignment. Agricultural land parcels traversed by the transmission line may experience impacts to property values (see *Table 3.11-11*).

Table 3.11-11
Potential Impacts to Property Values – Nucla-Norwood Southern Alternative

(from alignment)	Land Use	# of Units / Lots	Impact Level
Within 50 feet	Rural residential	3 / 2	Potentially Moderate to High
Between 50 and 300 Feet	Rural Residential	2 / NA	Potentially Moderate to High
Between 300 and 1,320 feet	Rural Residential	7 / 22	Moderate

Source: Geo/Graphics
N/A – Not Available

Norwood-Sunshine Alternative

115 kV Transmission Line Effects

Property Values

Properties within proximity to the Norwood-Sunshine Alternative would experience some degree of impact to property values. Each property would be uniquely impacted depending upon location, site characteristics, vegetation, topography, and other determining factors. A total of 46 rural residential properties currently lie within the transmission line corridor, which is 1,320 feet (one-fourth mile) on either side of the alignment. Approximately 255 undeveloped lots in San Miguel county are located within the corridor.

Property values of prime farmland and irrigated farmland would also be potentially impacted by the transmission line. Approximately 1,121 acres of prime farmland are located within the corridor, of which 38 acres are located within 100 feet of the alignment. An estimated 0.2-acre of irrigated farmland lies within 100 feet of the alignment. Agricultural land parcels traversed by the transmission line may experience impacts to property values (see *Table 3.11-12*).

Table 3.11-12
Potential Impacts to Property Values – Norwood-Sunshine Alternative

(from alignment)	Land Use	# of Units / Lots	Impact Level
Within 50 feet	Rural Residential	2 / 73	Potentially Moderate to High
Between 50 and 300 Feet	Rural Residential	8/ NA	Potentially Moderate to High
Between 300 and 1,320 feet	Rural Residential	36 / 182	Moderate

Source: Geo/Graphics
N/A – Not Available

Norwood-Telluride Alternative

115 kV Transmission Line Effects

Property Values

Properties within proximity to the Norwood-Telluride Alternative would experience some degree of impact to property values. Each property would be uniquely impacted depending upon location, site characteristics, vegetation, topography, and other determining factors. A total of 39 rural residential, one residential/commercial, and one rural residential/multi-family residential properties currently lie within the transmission line corridor, which is 1,320 feet (one-fourth mile) on either side of the alignment. Approximately 426 undeveloped lots in San Miguel County are located within the corridor.

Property values of prime farmland and irrigated farmland would also be potentially impacted by the transmission line. Approximately 1,125 acres of prime farmland are located within the corridor, of which 38 acres are located within 100 feet of the alignment. An estimated 0.2 acre of irrigated farmland lies within 100 feet of the alignment. Agricul-

tural land parcels traversed by the transmission line may experience impacts to property values (see *Table 3.11-13*).

Table 3.11-13
Potential Impacts to Property Values – Norwood-Telluride Alternative

(from alignment)	Land Use	# of Units / Lots	Impact Level
Within 50 feet	Rural Residential Multi-Family Res	3 / 71 1/	Potentially Moderate to High
Between 50 and 300 Feet	Rural Residential/ Multi-Family Res Res/Commercial	6 / NA 0 / NA 1 / NA	Potentially Moderate to High
Between 300 and 1,320 feet	Rural Residential Multi-Family Res Res/Commercial	30 / 355 lots 1 / 1 /	Moderate

Source: Geo/Graphics
N/A – Not Available

3.11.2.4 IMPACT OF THE SUBALTERNATIVES

115 kV Transmission Line Routing Alternatives

Subalternative A (in Naturita Canyon) would make minor changes to the Nucla-Norwood Southern Alternative impacts. Residences are located more than 0.5 mile from the subalternative. Impacts to residences would be less, from a visual perspective, than if Naturita Canyon was spanned. Since the subalternative crosses BLM lands, property value impacts may change somewhat.

Subalternative B would slightly reduce the number of residential units affected by the proposed alternatives in this location. Impacts would be similar to those described in *Impacts Common Among the Transmission Alternatives* and the Norwood-Sunshine or Norwood-Telluride Alternative. Property value impacts would still be considered potentially moderate to high for some units.

Subalternative C would minimize the number of impacted residences in the Fitts (Hillside Development) Subdivision. Only two residences would be in close proximity to the line. Impacts would be considered potentially moderate to high for those units.

Subalternative D would reduce the property value impact from high to no impact for the parcel of agricultural property that would have been crossed diagonally by the transmission line.

Subalternative E (Lime and Ilium Business and Industrial Park) would have similar impacts to the impacts described in *Impacts Common Among the Transmission Alternatives*.

Underground Subalternative

The Underground Subalternative across Beaver, Specie, Wilson and Sunshine Mesas would avoid the long-term visual impacts of the overhead lines and poles, and thereby, significantly reduce the potential for impacts to land values. This subalternative would also result in the existing poles and conductors being removed, thereby potentially having a beneficial effect on land values as well.

Norwood Substation Alternative Site B

The Norwood Substation Alternative Site B would minimize the impacts to residences near the existing substation during the construction period. Fewer residences would be affected at the new site. Property values would not be impacted at the new site.

3.11.2.5 CUMULATIVE EFFECTS

Construction of the Telluride Ski Area, continued development at Mountain Village and Telluride, and the San Miguel Hydroelectric Project, if developed simultaneously with the proposed Norwood-Telluride Project, would compete for construction labor within the region. Competition for affordable temporary housing would increase. Completion of all projects would increase assessed valuation in the area and increase overall property tax revenues. Construction activities contribute to the overall construction noise within the project area, which impacts quality of life. Construction and operation of the 115 kV transmission line in conjunction with SMPA's potential expansion of the Wilson and Specie Mesa Substations could result in cumulative, long-term impacts to visual quality and related property values on Specie and Wilson Mesas. Cumulative impacts to property values could extend beyond the corridor (1,320 feet) depending upon unique site characteristics and visibility conditions. Cumulative effects on Specie Mesa would apply to both the Norwood-Sunshine and Norwood-Telluride Alternatives. Cumulative effects on Wilson Mesa pertain to the Norwood-Sunshine Alternative only.

3.11 2.6 POTENTIAL MITIGATION MEASURES AND RESIDUAL EFFECTS

- Site the proposed transmission line in areas that would avoid close proximity to residential units or in terrain that would obscure visibility of the poles and line when possible. Minimize height of the transmission line.
- Schedule construction activities to avoid peak festival and tourist seasons whenever possible, so as to minimize impacts to the tourist population and interference with recreational activities.

Local mitigation measures could include establishing general energy codes and policies as part of local building codes. Also, electrical consumption pricing policies could be revised to encourage energy conservation.

Residual effects could include potential devaluation of residential and agricultural property due to the presence of the transmission line. For residential properties, these effects would be most significant when the line is first constructed and would likely diminish with time. Agricultural properties could have long-term residual effects depending upon how the line is situated on the property. Social concerns for those who prefer alternative forms of energy would continue. Natural views and vistas would be affected throughout the life of the Project, which could affect the overall quality of life for those people affected by the transmission line.

3.11.2.7 IMPACTS OF THE GENERATION ALTERNATIVES

The Generation Alternatives would result in a range of social and economic effects. If proposed by an energy developer in the future, additional studies would be necessary to quantify the specific beneficial and adverse social and economic impacts. For the purposes of this EIS, the following general tradeoffs are noted for the Distributed Generator Alternatives:

- Short-term construction-related effects to the economy and local facilities and services would be similar to those described for the Transmission Alternatives.
- Economic benefits to San Miguel County would likely be greater due to the increased cost of this technology and the increased tax benefits that would accrue.
- The economic impact to local SMPA ratepayers would potentially be significant with a DG Alternative, compared to the overhead transmission system. The costs of the

proposed overhead transmission system, estimated by Tri-State at approximately $16,000,000.00 (present value), would be spread amongst Tri-State's 44 members and estimated 950,000 customers. In comparison, the costs of a DG Alternative are estimated to range between $24,000,000.00 and $37,000,000.00, and would most likely need to be financed by SMPA's 10,000 customers.

- The reliability of power to the residents of the Telluride Area would improve over current conditions. However, among the Generation Alternatives considered, electrical power reliability could vary, depending upon the type and age of units installed (AESC 2000). See Chapter 2.0 for additional information on generator reliability issues. Overall, while this type of technology is considered reliable, electric power service could be interrupted for a short time (up to 20 minutes) in an event of an outage on the Hesperus-Telluride Line. In comparison, the proposed 115 kV transmission line would provide uninterrupted power supplies in the event of an outage.

- Compared to present conditions, the reliability of power to the residents of Norwood and Wrights Mesa could be diminished under the Large Generator Alternative in the event of an outage on the Nucla-Norwood section of line. Under this generation scenario, the existing line between Norwood and Sunshine would either be removed or converted to a distribution line. As a result, the Nucla-Norwood line would become a 'radial' line with no source of backup power. At present, residents served by the Nucla-Norwood line receive backup-power from the Hesperus-Telluride line in the event of a power outage.

- The Large Distributed Generator Alternative could allow the existing Nucla-Sunshine line to remain as a distribution line or be removed. In both of these cases, the potential impacts of the 115 kV transmission line on land values on Specie, Wilson and Sunshine Mesas would be avoided. However, the Small and Emergency Generator Alternatives would still require that the existing Nucla-Sunshine line be rebuilt as a new 69 kV line. Due to the similarity of these structures (*see Figure 2.3-1*), potential impacts to land values would be expected to be similar to those described above for the Nucla-Sunshine 115 kV line.

3.11.2.8 NO ACTION ALTERNATIVE

Under the No Action Alternative, the reliability of electrical power in Tri-State and SMPA's southwestern service region would continue to decline. Maintenance of the existing transmission lines would continue to be curtailed due to the inability to de-energize the Hesperus to Telluride transmission line for heavy maintenance. The pattern of heavy outages (41 unscheduled outages on the Hesperus to Telluride line and 75 unscheduled outages on the Nucla to Sunshine line in a 4-year period) would continue (See Chapter 1.0).

According to San Miguel Power Association, the financial burden of an estimated incremental $7.5 million to maintain and operate the existing line would be spread throughout the 9,600 SMPA customers and would increase electrical rates between 15 and 18 percent in the future.

In the long run, this lack of reliability would result in a decline in the quality of service to all customers, both local and regional. Power fluctuations, blackouts, and brownouts would occur more frequently throughout the system in the communities of Telluride, Norwood, Hermosa, Rockwood, Purgatory and Silverton. Unreliable power would have adverse impacts on local and regional employment, income, home heating, business operation, tourist-related businesses (restaurants and hotels), including the ski area, the airport, and emergency communications. Unreliable power could also have adverse impacts on other public services (medical facilities and schools, water and wastewater

treatment facilities, natural gas regulation, and communications). In the case of a power outage, with no long-term back-up power available, line repairs could take several days and pole repair would be especially difficult with frozen ground and deep snow. Indirectly, the continued growth and prosperity of the region could be adversely affected if the deteriorating power system results in frequent and/or prolonged power outages that affect the quality of life and services the resident and tourist populations expect.

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3.12 TRANSPORTATION

ISSUES: Construction of the Project may require new roads or improvements to existing roads that could impact natural resources. Construction crews and equipment accessing the project area may also cause short-term impacts to traffic and traffic delays. Through the NEPA process, potential impacts from traffic and new road construction should be documented and conflicts avoided to the extent possible.

3.12.1 AFFECTED ENVIRONMENT

REGIONAL TRANSPORTATION SYSTEM

The project area for transportation encompasses portions of Montrose and San Miguel Counties that would be utilized by construction crews for transporting equipment and materials to the project sites. Regional transportation systems are described below.

The transportation system in San Miguel and Montrose Counties is predominantly automobile oriented, relying almost exclusively on public roads and highways. The Telluride Airport also provides regional commercial and air-carrier service to the project area. As in most of rural Colorado, there is a fairly sparse skeleton of high quality, paved state highways connecting the larger communities, while the backcountry is accessed via a network of dirt roads surfaced, if at all, with local native materials. ***Plate TRANS-1*** shows the road system within the project area according to state and local road classifications.

The project area is served by paved state highways (SH) — SH 90, SH 97, SH 141, SH 62 and SH 145. SH 145 is the main highway spanning the project area, from SH 141, south of Nucla to the vicinity of Telluride. West of Telluride, SH 145 turns south at Society Turn towards Ophir, Dolores and Cortez. SH 145 is part of two national scenic byways — west of Placerville, SH 145 is part of the Unaweep-Tabeguache Scenic Byway, east of Placerville, SH 145 is part of the San Juan Skyway Scenic Byway. SH 145 is a slightly below standard rural highway with two 10-foot wide travel lanes and two- to six-foot-wide paved shoulders. Along the river corridor most shoulders are two to four feet wide. SH 141, west of its intersection with SH 145, is also part of the Unaweep-Tabeguache Byway. SH 141 turns south at its intersection with SH 145, and eventually intersects with US Highway 666. SH 90 and SH 97 are on the periphery of the project area, near Nucla and Naturita, as is SH 62, which leads to Ridgway from Placerville. These highways generally have two 12-foot-wide travel lanes and three- to six-foot-wide paved shoulders for most of their length within the project area. All roadways within the project area are designated in either poor or fair condition.

TRAFFIC COUNTS AND CAPACITIES

Traffic capacities for state highways are shown in *Table 3.12-1*. These capacities represent vehicles per day under good weather conditions, except where steep grades or tight curves reduce travel speeds or sight distances. Current traffic volumes on all roads, except SH 145 to Mountain Village, are usually below estimated capacity. Acceptable Levels of Service (LOS) on the highways are expected to be sustained at their current "A" (free flowing, low traffic density) to "D" (movements more restricted, with delays during short peaks, but lower demands occur often enough to permit clearing) levels in the near future. The volume to capacity ratios for each state highway are all acceptable as shown in *Table 3.12-1*.

LOCAL TRANSPORTATION SYSTEMS AND PUBLIC ROADS

Local county roads and public roads on National Forest and BLM lands are shown in ***Plate TRANS-1***. The project area is serviced by numerous roads that vary from county paved

secondary roads to tertiary roads such as improved dirt roads, four-wheel drive and high clearance trails. In the western part of the project area major local roads include 30.00, HH 31, HHII, II 35, 3575, 36.00, 37.80, 37.76, 39.00, and 40.00 Roads, which all connect to SH 145 in Montrose County, U29 Road south of Redvale, W35 and 38.Q Roads southwest of SH 145 near Norwood, 41.5Y and 43.Z Roads south of Norwood, 42.Z Road north and south of Norwood, and 44.Z, Lone Cone Road, in San Miguel County. Local north-south county roads providing access off SH 145 in the central and eastern extents of the project area encompass, among others, Specie Mesa Road, Fall Creek Road, Silver Pick Road and South Fork Road.

Table 3.12 –1
Average Daily Traffic Counts and Capacities (1997)

Town	Highway	Average Annual Daily Traffic	Volume/Capacity Ratio
Naturita	141 (E)	1732	0.22
Naturita	Intersection SH 141 & SH 97	1646	0.10
(Near Naturita)	Intersection SH 141 & SH 145	1200	0.08
Redvale	SH 145	1417	0.09
Norwood	SH 145 & County 422S	3043	.016
Placerville	SH 62 & SH 145	3725	0.36
Sawpit	SH 145	3988	0.37
Telluride	SH 145 (spur to Telluride)	4,300	0.41
Mountain Village	SH 145 & Fox Farm Rd.	6050	0.65
Source: CDOT 1997			

Access to the substations in the project area are from the following roads: 1) Nucla Substation - Montrose County 30.00 Road; 2) Norwood Substation - San Miguel County 42.Z Road; 3) Oak Hill Substation - San Miguel County V44 Road; 4) Specie Mesa Substation - San Miguel County M44 Road; 5) Wilson Mesa Substation - Silver Pick Road (San Miguel County 60.M) to San Miguel 59.K Road to San Miguel 57.6K Road; 6) Telluride Substation - SH 145; 7) Sunshine Substation - South Fork Road. (San Miguel County 63.L). All access roads to the substations are one or two lane gravel surface county roads, except for SH 145, which provides access to the Telluride Substation.

Transportation-Related Plans

The conceptual transportation plan (October 1998), completed by Carter-Burgess Traffic Engineers as part of the Telluride Land Use and Transportation Report (CPAC 1998), recommends action items, implementation schedules, and outcomes to improve the transportation situation in Telluride, Mountain Village, and outlying areas. These recommendations are tied to traffic volumes and population levels. The steep section of Highway 145 between Society Turn and Mountain Village often operates at an undesirable LOS. This section of highway operates at LOS E during peak hour traffic during peak seasons (USDA 1996). LOS E signifies that very long queues may create delays at intersections and traffic congestion occurs along the roadway.

The Uncompahgre National Forest is in the process of completing a Travel Plan. The document proposes a new travel plan for the forest to designate a transportation system of roads and trails to provide access for resource management and provide a spectrum of recreational opportunities for the public area-wide and on routes beyond the "base" (USDA 1998). The Final Travel Plan is expected to be completed in the summer of 2001.

Future STIP projects in the area could include improvements to the intersection of SH 145 and SH 62 near Placerville, and the Society Turn intersection between the spur to Telluride and

SH 145 to Mountain Village. These projects would be scheduled for completion after transmission line construction.

3.12.2 ENVIRONMENTAL CONSEQUENCES

3.12.2.1 ANALYTICAL FRAMEWORK

Potential Types of Impacts

The primary transportation impacts would be related to the following:

- construction traffic including large construction equipment and vehicle traffic associated with crews commuting to the staging site and then on to the job site,
- traffic delays and congestion along Highway 145 and in residential areas during construction activities,
- traffic safety hazards from construction activity along the highway during peak tourist seasons, and,
- transportation interference with off-highway travelers.

The general types of access impacts associated with constructing new roads or improving existing roads across public lands are also addressed in this section. Specific types of resource impacts associated with access road improvements are discussed in the individual resource sections of this EIS.

Construction of any of the Nucla-Norwood Alternatives in combination with the Norwood-Telluride or Norwood-Sunshine Alternative would increase the traffic volume on the state highways and nearby access roads. This increase would consist of individual transportation of the labor force from outside the local region to the staging area, as well as crews and equipment being transported to the job site as listed in *Tables 2.3-6* through *2.3-9* in Chapter 2. It can be assumed that 100 percent of the crew would have to commute to the Norwood staging area. Over 70 percent of the anticipated workforce would be considered non-local and would find housing accommodations within the region for the duration of the construction period. Most workers would temporarily locate in Norwood, Nucla, Ridgway, or Montrose and commute to the staging area from these locations. Section 3.11 describes socioeconomic impacts. Since the bulk of construction would occur during the spring, summer, and fall months, potential exists for conflicts between tourists and construction traffic throughout the project area.

No identifiable impacts are anticipated during the operation and maintenance phase of the Project.

Definition of Impact Levels

High Impact: Transportation impact levels are defined in this EIS as high according to the following criteria:

- Consequences of construction, operation and maintenance would have high transportation impacts if daily anticipated traffic delays of 15 minutes or longer, resulting in increased congestion and travel time, occurred on state or county roads.
- Emergency access to any portion of the transmission line corridor would be precluded by construction activities.
- Any permanent impact to roads or utility systems (electric, fiberoptics, pipelines, water or sewer, etc.).

Moderate Impact: Consequences of construction, operation and maintenance would have moderate transportation impacts if anticipated traffic delays of 5-15 minutes, resulting in increased congestion and travel time, occurred on state or county roads.

Low Impact: Consequences of construction, operation, and maintenance would have low transportation impacts if minor traffic delays (less than five minutes), increased congestion, or increased travel time occurred on state, county, forest service, or BLM roads.

PERMIT REQUIREMENTS, STANDARDS AND ORDINANCES

Federal – The Forest Service and the Bureau of Land Management will require the applicants to obtain a Special Use Permit and Right-of-Way grant, respectively, for use of public roads during the short-term project construction and long-term operation phases. If staging areas are required on public lands, the applicant must obtain a temporary use permit (Pfifer 1999: pers. comm.). *Plates PROJECT-3* through *PROJECT-8* in Chapter 2 summarize the access conditions for each of the project alternatives. The approximate number of miles of public roads potentially used during project construction and operation are described in this section for each of the alternatives.

State – Utility and construction permits for rights-of-way on State of Colorado School Trust Lands must be filed. The applicants will also need to obtain utility and temporary access permits from the Colorado Department of Transportation (CDOT) for traffic control and flagging and temporary access to the state highway for highway crossings, etc. Staging areas would also be included as part of the temporary access permit to ensure that highways are not being impacted by movement of equipment and materials.

County – Montrose County will require that the applicants obtain a utility permit and submit a traffic control plan (Logan 1999: pers. comm.). San Miguel County requires a special construction permit for construction activities along county roadways (Shafer 1999: pers. comm.). Traffic control and flagging requirements are components of these permits.

ENVIRONMENTAL PROTECTION MEASURES

In order to minimize the potential transportation impacts in the project area, the following Environmental Protection Measures (EPM) would be implemented for the proposed alternatives.

Table 2.2-4, Tri-State Standard Mitigation Measures numbers 1, 2, 18, 20, 22, 28, 30, 36, and 43, and *Table 2.2-5*, Watershed Conservation Practices for Nucla/Telluride Transmission Line Project numbers 3, 5, 6, 7, 8, 9, 11-15, 17-20, 26, 28, and 30, have been taken into consideration in assessing transportation impacts.

3.12.2.2 IMPACTS OF THE PRIMARY TRANSMISSION ALTERNATIVES

Nucla-Norwood Northern Alternative

115 kV TRANSMISSION LINE EFFECTS

The primary material staging area would be located in Norwood for all alternatives (Mundorff 1999: pers. comm.). Construction crews would travel eastward and westbound on SH 145. The average and peak construction workforce of 40 and 79, respectively, would commute to and from the staging area in the mornings and evenings. Other construction traffic within the region, particularly near Telluride, would be traveling to respective job sites during the same

time period. The capacities of the affected highways are considered adequate to handle the peak hour traffic; consequently, impacts to road systems would not be substantial.

Materials would be transported to the Norwood staging area from storage sites in Montrose during the material staging phase scheduled for February and March of 2000 (See *Table A-4-1)*. Material staging would consist of two trucks per day from Montrose to Norwood for two weeks (Mundorff 1999: pers. comm.). These trucks may require lead pilot cars depending on length of load and truck size and width. This level of truck traffic would have low to no identifiable impact to transportation in the region. During the wire-stringing phase of the Project, materials would again be transported from Montrose to the staging area in Norwood. Although the wire-stringing phase occurs during part of the peak tourist season (July through November 2001), it is anticipated that this traffic would have a low to no identifiable impact on transportation.

Crews would be leaving the staging area for various project sites along the right-of-way. Crews would use SH 145 westbound for the Nucla-Norwood Northern Alternative from August through December 2000, and again from February through November 2001. Vehicles leaving the staging area each day are not expected to exceed 29 (See *Table A-1.3-1* Personnel and Equipment Required For Construction of 115 kV Overhead Lines). Peak traffic generated by the Project would occur during excavation and structure assembly. In addition, heavy equipment, material handling equipment, and tractor-trailer mounted oversized loads would also be transported to and from the Norwood staging site, increasing westbound Highway 145 traffic levels. Impacts to transportation systems from these traffic levels should be low.

Construction on the Nucla-Norwood Northern Alternative would have a potentially low to moderate impact on traffic on the section of Highway 145 that is approximately 1.25 miles east of the intersection of Highway 141 and Highway 145, extending approximately 5.0 miles into the community of Redvale. Portions of this section of Highway 145 (Link 1, mile marker 1.7, and mile markers 5.0 to 6.3) are adjacent to the existing 69 kV and proposed 115 kV transmission line right-of-way. Construction activities would affect traffic speed, flow patterns and travel time, and would require flagging and signage in this area (which should be adequate to maintain traffic safety). Heavy equipment and crew transportation vehicles listed in *Table A-1.3-1*, and staging out of Norwood would also merge with the local resident and tourist traffic on that section of the scenic byway, potentially causing delays and increased travel time.

Colorado Department of Transportation (CDOT) has estimated Average Annual Daily Traffic (AADT) counts at 1,200 vehicles along this segment of the highway (Link 1, mile marker 1.8). During the summer season these AADT counts could be higher due to tourist traffic along the scenic byway. Low to moderate impacts may occur due to traffic delays and increased travel time. Once construction activity along the transmission line leaves the area of Redvale, the impact on transportation would be considered low. Access to this region requires improvements (near Link 1, mile marker 12.0) for 0.8 mile of the existing access road.

Access roads off Highway 145 consist of improved dirt roads, four-wheel drive and high clearance roads. Local roads providing access to this alternative corridor include II35, W35, 42.Z, 43.Z, and 44.Z Roads (see ***Plate TRANS-1.****)*. Congestion from construction equipment, materials delivery, and crews to different locations along the line may occur, however, low impacts to transportation are anticipated in these areas. Recreational users may experience low traffic impacts.

Construction activities around rural residences and towns (*e.g.* Redvale) along the right-of-way, but not on Highway 145, would have low to moderate impacts on transportation due to potential delays and increased travel time.

Public BLM roads potentially used for construction or operation of this alternative are estimated to include approximately 0.6 mile of roadway. Approximately 15.7 miles of county

roads would be used (see *Plate TRANS-1*). Overall, this alternative would not require any new access roads or the upgrading of existing roads.

Substation Effects

Any of the Nucla-Norwood alternatives would require the expansion of the Norwood Substation, which would be easily accessed by existing improved dirt roads. The site expansion would require use of excavation equipment, dump trucks, cement trucks, and a peak workforce of 23 crew members at any given time. Expansion of the site would require the import of approximately 3,000 cubic yards of fill dirt. Approximately 150 truck trips would be required for this activity. Site grading is scheduled to be completed in one month. All substation improvements should be completed in five months. Moderate impacts on transportation would be anticipated due to the duration of impact and low traffic volumes in the area. Local roads primarily affected by this expansion include SH 145, 42.Z Road, Y43 Road, and 41.5Y Road. Substation modifications at the Nucla Substation would also have low to no identifiable effects on transportation systems.

69 kV Transmission Line and Distribution System Effects

This alternative essentially consists of rebuilding the existing 69 kV transmission line to 115 kV. No additional impacts from SMPA's distribution system improvements would result on local roadways beyond those described for the 115 kV line.

Nucla-Norwood Central Alternative

115 kV Transmission Line Effects

The primary access to this alternative would be via SH 145 and SH 141. Crew and equipment staging would occur as described for the Nucla-Norwood Northern Alternative. Additional access may be gained by use of HH31, II35 and AA42 Roads.

The Nucla-Norwood Central Alternative would require the upgrading of existing access along 12.3 miles of the corridor. Access improvements would primarily consist of building spur roads off the existing access to Tri-State's Nucla-Cahone 115 kV line and improving/widening access on public BLM lands. Overall, approximately 9.3 miles of public BLM roads would be used during project construction. Approximately 39.2 miles of county roads would also be used (see *Plate TRANS-1*). A right-of-way grant and/or a temporary use permit would be obtained from BLM for using public roads during construction and, where necessary, for long-term maintenance.

The transmission line would cross SH 141 approximately 0.25 mile west of the SH 145 and SH 141 intersection (Link 4, mile marker 1). The transmission line would again cross SH 141 approximately 4.6 miles south of the Highway 145 and Highway 141 intersection (Link 4, mile marker 7). Both of these crossings occur at near perpendicular angles and would have a low impact on transportation. CDOT has recorded an AADT of 780 vehicles on the first crossing of SH 141 and 340 AADT on the southern crossing of SH 141. Access to this segment of the line is provided by HH31 Road.

When the transmission line approaches a point south of the community of Redvale (Link 5, mile marker 5), helicopter construction methods would be undertaken for 0.8 mile.

Existing access through rural residential areas would then be used for the majority of the remaining distance to the Norwood Substation, except an approximate 0.5 mile of access

requiring width upgrades (Link 5, mile marker 12). Low impacts to transportation are expected on these residential dirt roads.

Substation Effects

Transportation impacts would be identical as those described for the Nucla-Norwood Northern Alternative.

69 kV Transmission Line and Distribution System Effects

Equipment staging would occur as described for the Nucla-Norwood Northern Alternative. The workforce for construction of the distribution lines would be fewer than 11. The distribution system would require some large vehicles and a backhoe. No identifiable impacts to transportation are anticipated. The existing 69 kV line would be removed for 10.7 miles, approximately 5.0 miles of which are adjacent to SH 145. The dismantling of the 69 kV line would result in short-term impacts on SH 145 due to the presence of utility crews and equipment along the highway. This process would have a short-term low impact on transportation since removal of the line would proceed at a faster rate than construction and would require less equipment and fewer work crews. Other local roads likely affected by the dismantling of the 69 kV line include HH, 35.00, II, II35, 35.75, 37.76, 39.00, and 40.00 Roads in Montrose County.

Nucla-Norwood Southern Alternative

115 kV Transmission Line Effects

Crew and equipment staging would occur as described in the Nucla-Norwood Northern Alternative. Access to this alternative corridor would be provided by SH 145, SH 141, and HH31, II35, AA42 and W35 Roads.

The Nucla-Norwood Southern Alternative would require the upgrading of existing access along 15 miles of the corridor. Access improvements would primarily consist of building spur roads off the existing access to Tri-State's Nucla-Cahone 115 kV line and improving/widening access on public BLM lands. Existing exploration seismic disturbances would be widened from about 4 feet to 12 feet along approximately 9.8 miles of this alternative. Overall, approximately 21.8 miles of existing and future public BLM roads would be used during project construction. A right-of-way grant would be obtained from BLM for using these roads during construction and, where necessary, for maintenance. Approximately 60.2 miles of county roads would also be used (see ***Plate TRANS-1***).

The construction of the Nucla-Norwood Southern Alternative would cause similar impacts as the Nucla-Norwood Central Alternative, except in lengths of road improvements and length of helicopter construction. Ground access improvements would total 15 miles, helicopter construction would be 1.7 miles, and only 1.5 miles of the line would be reached utilizing existing access. This would have low to no identifiable impacts on transportation.

Many of the same improved dirt, four-wheel drive, and high clearance roads that serve as access to the Central Alternative would also serve the Southern Alternative route. There would be no identifiable impacts except during structure assembly and wire stringing, which would occur during the hunting season.

Substation Effects

Transportation related effects of this alternative would be identical to those discussed for the Nucla-Norwood Northern Alternative.

69 kV Transmission Line and Distribution System Effects

Equipment staging would occur as described for the Nucla-Norwood Northern Alternative. The workforce for construction of the distribution system modifications would be fewer than 11.

The existing 69 kV line would be removed for 15.3 miles, approximately 5.0 miles of which are adjacent to SH 145. The dismantling of the 69 kV line would result in short-term impacts on SH 145 due to the presence of utility crews and equipment along the highway. This process would have a short-term low impact on transportation since removal of the line would proceed at a faster rate than construction and would require less equipment and fewer work crews. Other local roads potentially affected include HH, 35.00, II, II.35, 35.75, 37.76, 39.00, and 40.00 Roads in Montrose County.

Norwood-Sunshine Alternative

115 kV Transmission Line Effects

Crew and equipment staging would occur as described for the Nucla-Norwood Northern Alternative.

The Norwood-Sunshine Alternative varies from the Norwood-Telluride Alternative at a point approximately 0.75 mile west of Fall Creek Road (Link 13) and continues south along the existing 69 kV alignment. Access to this alternative would be via State Highway 145, 45.Y Road, V44 Road, W44 Road, 46.X Road, Specie Mesa (M44), P52 , Fall Creek (57.P), Silver Pick (60.M), and South Fork (63.L) Roads.

The 115 kV transmission line would be constructed to replace the existing 69 kV transmission line to its termination at the Sunshine Substation. Transportation impacts would be low due to the low volume of traffic where the transmission line crosses the South Fork Road.

Overall, the Norwood-Sunshine Alternative would require the upgrading of existing access along 2.8 miles of the corridor. Access improvements would primarily consist of building spur roads off the existing access south of the Norwood Substation and west of Specie Creek Road. Approximately 25.8 miles of BLM and USFS roads would be used during project construction. A right-of-way grant would be obtained from BLM and a Road Use Permit from the USFS for using these public roads during construction, operation, and maintenance. Approximately 70.4 miles of county roads would also be used (see *Plate TRANS-1*).

Substation Effects

Crew and equipment staging would occur at the Sunshine Substation. The presence of construction crews and equipment should have a low impact on traffic on local roads, specifically the South Fork Road (63.L). Approximately 200 cubic yards of fill would be imported, requiring approximately 10 truck trips during the estimated two week site grading activity. All modifications to the Sunshine Substation would be completed within a three-month period. Short-term disruptions to local traffic and recreation use may occur.

Traffic and transportation impacts to other substations, including dismantling the Oak Hill Substation and making minor modifications to the Wilson Mesa and Specie Substations, would be the same as described above for the Norwood-Telluride Alternative.

69 kV Transmission Line and Distribution System Effects

Four miles of overhead three-phase distribution line would be constructed between the Norwood and Oak Hill Substations if this alternative were selected. Low impacts to local roads would occur, including 45.Y Road, 43.Y Road, W44 Road, and V44 Road. In addition, approximately 2.0 miles of distribution line would be underbuilt on the 115 kV transmission line poles east of the Specie Mesa Substation. No additional traffic impacts would result beyond those previously noted for the 115 kV transmission line. Overall, impacts to traffic and transportation would be low.

Norwood-Telluride Alternative

Crew and equipment staging would generally occur as described for the Nucla-Norwood Northern Alternative. Due to the amount of helicopter construction required for this alternative, a staging area would also be established on Wilson Mesa for purposes of transporting materials and crews to the individual pole sites along upper benches of the San Miguel River Canyon. In addition, materials for the Telluride Substation expansion would be stored at the existing substation site, rather than at Norwood.

115 kV Transmission Line Effects

Access to this alternative would primarily be along SH 145, as well as a number of local county and public roads, including 43.Z, 45.Y, W44, V44, 46.X, P52 Roads, Specie Creek Road (M44), Fall Creek Road (57.P), Silver Pick Road (60.M), Bilk Creek Road (62.K), and South Fork Road (63.L). Along the western half of the Norwood-Telluride Alternative, approximately 2.8 miles of the corridor would require improved access at Link 11, mile marker 1, and Link 13, mile marker 10. Helicopter construction methods would be used at Link 13, mile marker 2, and Link 19, mile markers 1 to 3. The majority of crew traffic would travel east on Highway 145 after approximately the end of April 2001. Specifically, the construction schedule for surveyors would be September 2000; for access development and clearing, October 2000; for excavation, April 2001; for structure assembly, May 2001; and for wire stringing, August 2001.

Traffic impacts along SH 145 would be low to moderate. Construction from Link 19 to its termination at the Telluride Substation would be in close proximity to SH 145 and would cross the highway near a boating access on the San Miguel River, and then again approximately 1.0 mile south. This section of SH 145 is extensively used by tourists and regional and local residents traveling to and from Telluride, Mountain Village, or over Lizard Head Pass on the San Juan Skyway Scenic Byway. Average annual daily traffic counts on this section of highway are 3,800 vehicles. Also, many kayaks, rafts, and other crafts launch during boating season within Link 20. Recreational activities are abundant along this section of the river and, consequently, any parking along or access to the river is in high demand, particularly during the summer months (See Section 3.9, Recreation).

The South Fork Road (63.L) to Ilium Valley would also be impacted by construction activity. The road provides access to a commercial/industrial/multi-family residential area, as well as to residents and recreationists using the road to access homes and recreational resources in Ilium Valley. Traffic congestion on this road would increase. Short-term low to moderate impacts would occur on the South Fork Road due to traffic delays and increased travel times.

Along the last 8.0 miles of the Norwood-Telluride Alternative, the anticipated arrival of the excavation crews is in June of 2001, and the structure assembly crews in September 2001. These dates could conflict with local festival and weekend events. If this alternative were selected, moderate traffic impacts would be expected due to traffic delays involving construction conflicts with river and trail access, and tourist and resident traffic.

Overall, the Norwood-Telluride Alternative would require the upgrading of existing access along 2.8 miles of the corridor. Access improvements would primarily consist of building spur roads off the existing access south of the Norwood Substation and west of Specie Creek Road. Approximately 21.3 miles of BLM and USFS roads would be used during project construction. A right-of-way grant would be obtained from BLM and a Special Use Permit from the USFS for using these roads during construction, operation, and maintenance. In total, approximately 60.7 miles of county roads would also be used (see ***Plate TRANS-1***).

Substation Effects

Minor modifications to the Telluride Substation would have low to no identifiable effects on traffic or transportation systems. Materials for the substation expansion would be stored at the substation site. Traffic at the substation would primarily affect SH 145. No truck traffic would be needed for the import or export of dirt as a result of minor substation grading. Construction activity would require a five to nine person crew for 11 weeks. Dismantling the Oak Hill and Wilson Mesa Substations, and making minor improvements to the Specie Mesa Substation may have a low impact on transportation, particularly the Wilson Mesa and Specie Substations since they are in rural residential and estate residential areas. Local roads temporarily affected in these areas include 45.Y and V44 Roads to the Oak Hill Substation, Specie Creek Road (M44) to the Specie Mesa Substation, and Silver Pick Road (60.M), 59.K, and 57.6K Roads to the Wilson Mesa Substation.

69 kV Transmission Line and Distribution System Effects

With implementation of this alternative, the existing 69 kV line would be removed along 10.4 miles of its length, from west of Fall Creek Road to the Sunshine Substation. This process would have a short-term low impact on transportation since removal of the line would proceed at a faster rate than construction and would require less equipment and fewer work crews. Local roads affected by the dismantling of the 69 kV line include 60.M, 59.K, 57.6K, 62.K and 63.J Roads, and the South Fork Road (63.L).

No identifiable impacts are anticipated during the operation and maintenance phase of the Project.

With respect to SMPA's distribution modifications, 4.0 miles of overhead three-phase distribution line would be constructed between the Norwood and Oak Hill Substations, if this alternative were selected. Low impacts to local roads would occur, including 45.Y, 43.Y, W44, and V44. In addition, approximately 2 miles of distribution line would be underbuilt on the 115 kV poles east of the Specie Mesa Substation. No additional traffic impacts would result beyond those previously noted for the 115 kV line. Overall, impacts to traffic and transportation would be low.

On Wilson Mesa, the existing 69 kV line would be changed to an underground and overhead distribution system, in order to maintain service to local residents. Impacts to traffic and transportation would be low and would primarily affect Fall Creek Road (57.P), Silver Pick Road (60.M), 59.K and 57.6K Roads. At the eastern end of the project area, near the Telluride Substation, approximately 1.0 mile of distribution line would be undergrounded. These changes would be scheduled to overlap in July 2001 (*Table A-4-1*). Moderate impacts should be expected during this two-week phase. Undergrounding of the 1.0 mile of existing overhead

distribution line near the Telluride Substation would have moderate impacts on transportation, mainly along Highway 145 and the South Fork Road. Traffic delays would be experienced and construction conflicts with tourist traffic is likely with the July construction schedule.

3.12.2.3 IMPACTS OF THE SUBALTERNATIVES

115 kV Transmission Line Routing Alternatives

Subalternative A would have a low impact on traffic and transportation systems near Naturita Canyon. Local roads affected by routing the line in the bottom of Naturita Canyon include AA42, W35 and 38.Q Roads.

Subalternatives B, C and D would have short-term low traffic and transportation-related impacts on nearby residential areas in the vicinity of Norwood and Oak Hill Substations. Local residents may experience some traffic congestion due to construction activities. Local roads potentially affected by Subalternative B would include 42.Z and Y43 Roads, and residential roads in the Fitts Subdivision. Subalternative C would affect 42.Z Road, and potentially residential roads in the Fitts Subdivision. Subalternative D would affect V44 and potentially 44.Z Roads.

Subalternative E would have a low to moderate impact on SH 145 and the South Fork Road. This subalternative would replace a portion of the Norwood-Telluride Alternative and would avoid two crossings of SH 145. Construction crews and equipment would still stage out of Norwood and cause slight congestion when combined with resident and tourist traffic, but the transportation impact should be reduced to low at the Ilium Business Park location.

Underground Subalternative

The Underground Subalternative would have similar impacts to roads and transportation systems across Beaver, Specie, Wilson and Sunshine Mesas as the Norwood-Sunshine Alternative. Impacts are assessed as short-term and low.

Norwood Substation Alternative Site B

The Norwood Substation Alternative Site B would have a low impact on traffic and transportation. Local roads affected by this alternative include Y43 and 43.Z Roads, with some excavation along access roads for the underground portion of distribution wires. This substation site alternative would necessitate the import of approximately 2,000 cubic yards of fill. Approximately 100 truck trips would be required for this activity during the three-week site grading and road construction period. The total Project would take approximately five months to complete with crews ranging from five to twenty-two workers.

3.12.2.4 CUMULATIVE EFFECTS

There are some planned burns south-southeast of Redvale that may occur between 2001 and 2010. This may affect access to any of the Nucla-Norwood Alternatives for a very short period of time since it is likely that W35 road would be used to reach the State Trust Lands scheduled to be burned. Since many roads service this area no identifiable impact is expected. However, Links 5 and 6 may experience some conflicts with surveying and the scheduled burns.

The Telluride Ski Area expansion would increase traffic volume on Highway 145. Construction traffic at the ski area would coincide with the transmission construction schedule, exacerbating the already moderate level of impact on Highway 145 for either the Norwood-Sunshine or Norwood-Telluride Alternative. Moderate to high impacts would be expected.

The proposed San Miguel River Hydroelectric Project could exacerbate the transportation impacts of the proposed Project during construction. Cumulative traffic impacts could also occur on SR 145, Fall Creek Road, Silver Pick Road, 57.K Road, and Specie Mesa Road, if SMPA expands the Wilson Mesa and/or Specie Mesa Substations during the same timeframe as the construction of the 115 kV transmission line. Presence and operation of construction equipment and vehicles from both could pose short-term delays and traffic congestion on local access roads on the mesas. Cumulative effects on Specie Mesa would apply to both the Norwood-Sunshine and Norwood-Telluride Alternatives. Cumulative effects on Wilson Mesa pertain to the Norwood-Sunshine Alternative only.

3.12.2.5 POTENTIAL MITIGATION MEASURES AND RESIDUAL EFFECTS

Any combination of the Nucla-Norwood Northern Alternative, Norwood-Telluride Alternative, and the Telluride and Sunshine Substation modifications should be scheduled to occur, when possible, during non-peak tourist seasons, or to avoid construction activity during characteristically high visitation weekends (*i.e.* Memorial Day, July 4th, Labor Day). Particular care should be taken to avoid construction traffic conflicts during the Telluride Bluegrass Festival and the Telluride Film Festival. These events occur in mid-June and Labor Day weekend, respectively, and last from four days to a week. Each can be expected to attract approximately 15,000 visitors, leading to greater than average traffic congestion and demands on services. There are a number of lesser events that may have very short-term (a few hours), but high levels of transportation impact. These events include the Telluride Bicycle Classic in early June, which includes a bicycle road race to Lizard Head Pass, located south of Telluride on SH 145, and the Telluride Jazz Celebration in August. Implementation of required traffic control plans would help mitigate hazards along the sections of Highways 145 and 141 that are under and near the transmission line right-of-way.

Residual transportation effects include existing roads, which were widened or improved, and new spur roads built to poles for project construction. These roads would not be closed or revegetated. Overland construction methods may trample ground vegetation, however, these impacts would be temporary and mitigated once vegetation has recovered.

3.12.2.6 IMPACTS OF THE GENERATION ALTERNATIVES

The Generation Alternatives would have short-term impacts on roads and transportation during the construction phase. The specific roads and areas affected would depend upon where a facility is sited, if proposed by an energy developer in the future. Impacts to SR 145 and/or South Fork Road would be expected if a facility were located at Society Turn or in Ilium Valley. Overall, construction-related impacts to roads and transportation systems would be less than significant and temporary in nature. Related effects would also include temporary short-term impacts from modifications to transmission systems, distribution lines and substations between Nucla and Sunshine. These impacts would be similar or the same as those described previously for one of the Nucla-Norwood Alternatives and the Norwood-Sunshine Alternative.

A generation alternative also has the potential to adversely affect transportation safety during project operation. As discussed in Section 3.10 (Visual Resources), a water vapor plume from the gas turbine reaching up to 100 feet in height could occur if the generator was operated during cold winter periods. In temperatures below freezing, it is possible that the gas turbine exhaust would contribute to ice fog, which is extremely hazardous to automobile traffic (AESC 2000). Depending upon if and where such a facility is build, ice fog could be a safety issue for SR 145 and for the South Fork Road. These impacts are considered potentially significant and would require further study if a generator is proposed on federal lands in the future.

3.12.2.7 NO ACTION ALTERNATIVE

The existing transportation conditions in the region would remain the same with the No Action Alternative. Traffic volume would increase concurrent with the growth patterns of the region. Current access on improved dirt, four-wheel drive, and high clearance roads to the transmission line corridor and substations would not change. However, more frequent failure of the lines would cause increased traffic by SMPA vehicles for maintenance purposes.

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3.13 NOISE

ISSUES: Construction activities may cause short-term noise impacts due to the presence and activities of construction crews and equipment. Noise impacts can diminish the quality of residential settings and recreational experiences if sustained over a long period. Concerns have also been raised about whether transmission lines and substations would generate noise during project operation.

3.13.1 AFFECTED ENVIRONMENT

REGIONAL OVERVIEW

The project area extends from Nucla in Montrose County to Telluride in San Miguel County, in southwestern Colorado, and encompasses a number of small communities and rural residences. The existing noise environment in the vicinity of the proposed upgrade is similar to many other rural or suburban areas. With few exceptions, existing ambient noise levels are typically low. The exceptions include the Nucla Power Plant in Nucla, gravel mining operations in Nucla, Norwood, and Telluride, other minor industrial activity, and road traffic along State Highway (SH) 145. Ambient noise levels increase near the more developed areas, including along State Highway 145, airports, and urban areas, particularly around Telluride. Section 3.8 (Land Use) addresses land uses and jurisdictions in the project area.

Airborne sound is a rapid fluctuation of air pressure above and below atmospheric pressure. Most sounds are composed of a broad band of frequencies, each with its own sound level, which add together to make up a sound. Sound levels are usually measured and expressed in units called decibels (dB).

The noise levels in this assessment are presented in terms of decibels in the A-weighted scale (dBA). The A-weighted scale was developed to better simulate human hearing, which is less sensitive to low frequencies and extremely high frequencies, while being more sensitive to midrange frequencies.

The decibel scale compresses the large range of sound pressures detected by the ear into a scale that ranges from zero (0) dBA (hearing threshold level) to 120 dBA (painfully loud) to 140 dBA (hearing loss). On the decibel scale, an increase of 3 dBA over an existing level results in a doubling of the sound level.

Baseline noise levels shown in *Table 3.13-1* are daytime and nighttime equivalent noise levels (L_{dn}) in dBA. The L_{dn} is a measurement of the equivalent sound level with a 10 dB weighting applied to the nighttime hours of 10 p.m. to 7 a.m. The 10 dB weighting is applied to the nighttime hours because noise levels are perceived to be higher and more annoying during nighttime hours. *Table 3.13-1* describes typical values of yearly day/night average sound levels.

Ambient noise levels along the alternative corridors were not measured specifically for this Project; however, reasonable estimates can be made (National Academy of Science/National Research Council (NRC) 1977). As described in Section 3.8, land uses in the northwestern and central portions of the study area generally consist of agricultural land, ranch land, open space, and rural residences with low population density. Existing ambient noise levels are quite low in the rural settings of the project area. Day-night average levels (L_{dn}) are estimated to be 35 dBA. Where industrial activities occur in this region (Nucla Power Plant and sand and gravel operations), ambient noise levels would be higher. In the agricultural areas and small communities in Montrose and San Miguel counties, L_{dn} are estimated to be in the range of 35 to 50 dBA. In the southeastern portion of the study area, near Telluride, community development along with vehicular traffic and air traffic contribute to localized greater ambient noise levels. In addition, noise from ongoing construction and industrial activities occurs in the

Telluride area. Based on *Table 3.13-1*, noise levels are expected to range from 40 to 60 dBA. Actual existing ambient noise levels near the proposed upgrade alternatives would be affected by existing major noise sources, local terrain features, and the location of sensitive noise receptors.

Table 3.13-1
Typical Values of Yearly Day-Night Average Sound Levels

Description	Population Density (People/Sq. Mi.)	L_{dn} - dBA
Rural (undeveloped)	20	35
Rural (partially developed)	60	40
Quiet Suburban	200	45
Normal Suburban	600	50
Urban	2,000	55
Noisy Urban	6,000	60
Very Noisy Urban	20,000	65

L_{dn} = daytime and nighttime equivalent noise levels
Source: USDA Forest Service. Fraser Valley Loop Transmission Line Project DEIS. April 1996

Other existing noise sources within the immediate project area may include the existing 69 kV transmission line and substations. There are various noise sources associated with high voltage electricity transmission. Although usually inaudible beyond the transmission line right-of-way, corona noise, a broad band noise consisting of many frequencies, is usually described as a frying, cracking, or hissing sound. In addition, transformers produce a constant low frequency hum. Transmission line noise is most recognizable at higher elevations and during foul weather. Noise decreases with distance and in most instances the audible noise of a 69 kV line would be masked by naturally occurring sounds at locations beyond the edge of the right-of-way (USDA 1996).

SENSITIVE NOISE RECEPTORS

The primary sensitive noise receptors within the study area are residential units. Several residential units and small subdivision developments are currently within close proximity to the existing 69 kV line, substations, and proposed project alternatives. Other potential sensitive receptors would include dispersed recreationists who utilize private and public lands within the study area for recreational activities such as cross-country skiing, ice climbing, hiking, mountain biking, camping, hunting and fishing. The distribution of sensitive receptors is described further in EIS Sections 3.8 (Land Use) and 3.9 (Recreation), and shown in ***Plates LAND-1, REC-1*** and ***REC-2***.

3.13.2 ENVIRONMENTAL CONSEQUENCES

3.13.2.1 ANALYTICAL FRAMEWORK

POTENTIAL TYPES OF IMPACTS

Construction of the Project would primarily result in short-term noise impacts during construction. Operational noise generated by the expanded or modified substations and transmission and distribution lines would be minimal. Corona noise from the overhead lines would generally be low (35 dBA) at these voltages and negligible outside the transmission line right-of-way. Vehicles used for occasional inspection and maintenance of the substation and lines would produce occasional short-term noise along the transmission line right-of-way. Consequently, the Environmental Consequences discussion focuses on short-term construction-related effects.

Chapter 2 (Alternatives including the Proposed Action) contains descriptions of construction procedures and equipment used in construction for the proposed action and alternatives. *Table 3.13-2* describes noise levels of various construction equipment, which are typically required in the installation of transmission line, erection of structures, stringing of conductors and ground wires, and construction of substations. These noise ranges represent equipment operation at approximately 50 feet (BLM 1983).

Table 3.13-2
Noise From Construction Equipment

Equipment	Typical Range [1]
D-8 bulldozer, or equivalent	82-95
Tractors (various)	74-98
Trucks (various)	70-97
Truck leaving construction site	72-80
Backhoe	80-92
Truck with auger	82-92
Scrapers and graders	76-98
Ditching machine	80-90
Motor crane (small)	74-87
Motor (large)	80-96
Pickup	70-85
Concrete mixers	72-91
Excavator	75-90 [2]
Asphalt compactor	75-90 [2]
Welding rig	72-82
Helicopter (turbine powered at 250 ft.)	70-94

[1] Data adapted from EPA NITID 300.1, 1972, pg 2-108 and other sources (levels are in dBA at 50-foot reference distance.) These values are based on a range of equipment and operating conditions.
[2] Estimated noise levels

Noise impacts during construction would occur from ground-based construction at each pole site, grading of access roads, truck traffic, and the use of helicopters for construction where needed. The noise levels during construction could become high enough to cause a disturbance to private residences and animal life; however, the noise impacts at any one sensitive receptor would be from one or two pole sites and only occur for short periods of time.

The State of Colorado, under Noise Abatement CRS 25-12-101 to 25-12-108, defines noise standards. This statute states definitions of where the article applies, maximum permissible noise levels, action to abate, violation, and noise restrictions. Noise standards are shown in *Table 3.13-3*. Commercial standards shown on this table would apply to the proposed Project.

Table 3.13-3
State of Colorado Noise Standards

Zone	7 a.m. to 7 p.m.	7 p.m. to 7 a.m.
Residential	55 dBA	50 dBA
Commercial	60 dBA	55 dBA
Light Industrial	70 dBA	65 dBA
Industrial	80 dBA	75 dBA

Source: Colorado Revised Statutes 25-12-101 to 25-12-108

San Miguel (Building Department 1999) and Montrose (Hunt 1999) counties do not have noise ordinances or standards, therefore Colorado Statutes would apply.

DEFINITION OF IMPACT LEVELS

Impacts from noise would be characterized as follows:

High Impacts High impacts would occur in instances where:

- Adopted federal, state, or local standards, noise elements, or ordinances would be exceeded in noise level, timing, or duration for the long-term at the nearest permanent receptor. Higher noise levels affecting transient receptors (recreationists) would not be considered high impacts.
- Higher noise levels, related to helicopter use during construction, occur within range of sensitive receptors for more than several hours in any one day.
- An increase in noise of as little as 5 dBA over ambient levels occurs during quieter hours (10 p.m. to 7 a.m.).

Moderate Impacts Moderate impacts would occur in instances where:

- Noise levels would exceed Colorado noise standards for a sustained period of time (over several hours).

Low Impacts Low impacts would occur in instances where:

- Noise levels would exceed ambient noise levels and cause annoyances to residents or recreationists for a sustained period of time during construction.

APPLICABLE PERMITS, STANDARDS AND ORDINANCES

There are no Federal ambient noise standards that would directly regulate noise from construction or operation of the Project. However, the U.S. Environmental Protection Agency has developed guidelines on recommended maximum noise levels to protect public health and welfare (EPA 1974). For example, 55 dBA is the maximum for the annual average day-night level (Ldn) in outdoor areas. (EPA 1978)

ENVIRONMENTAL PROTECTION MEASURES

In order to minimize the potential noise impacts in the project area, the following Environmental Protection Measures (EPM) would be implemented for the proposed Project: *Table 2.3.13* Tri-State's Standard Mitigation Measures, numbers 16 and 42. These EPMs have been taken into consideration in assessing impacts on public and private lands.

3.13.2.2 IMPACTS OF THE PRIMARY TRANSMISSION ALTERNATIVES

Nucla-Norwood Northern Alternative

115 kV TRANSMISSION LINE EFFECTS

The construction phase of the 115 kV line upgrade would entail completing nine generally sequential activities as described in Appendix A-1. These activities include surveying and engineering, access development, clearing of right-of-way, material staging, excavation, structure assembly, wire stringing, post-construction cleanup, and restoration.

A total of 190 structures would be installed. The poles would be set using conventional construction methods, either by improving existing roads or using overland construction. The staging area for the proposed 115 kV line would be located in Norwood (S. Mundorff 1999: pers. comm.). The nearest sensitive land uses to the construction zones are rural residential units. ***Plate LAND-1*** shows sensitive receptors by type.

There are approximately 87 residences within the corridor. Short- term construction noise may be audible to these residences, but construction would not occur at night, and is not expected to exceed the Colorado recommended standard for residential (55 dBA) and commercial (60 dBA) zones for more than several hours, or at most, several days. These impacts would be short-term and temporary, and are considered moderate in degree.

Long-term noise impacts related to project operations and maintenance are anticipated to be low or no identifiable effect. Noise emissions from the transmission line are not expected to exceed Colorado standards based on a study conducted by Radian Corporation (USDA 1996) to determine electrical characteristics of a 138 kV line. According to the study, a worst case level that would occur at the edge of the right-of-way from operation of a transmission line would not exceed 35 dBA. Noise impacts would be generated during periodic transmission line maintenance by ground vehicles and personnel. These impacts would be infrequent and are not expected to contribute to long-term changes in the existing noise environment.

Substation Effects

Construction personnel and equipment for the Norwood Substation expansion are summarized in Appendix A-1 (Construction of Substation Facilities). The equipment staging area for the substation construction would be located in Norwood. The construction period is estimated at five months, from May through September. The closest sensitive receptor to the expanded Norwood Substation is less than 1,000 feet from the site and may experience low to moderate noise impacts from construction activity. Noise levels inside residences near construction activity would be much lower, as outside walls of houses typically reduce high-frequency noise levels by 20 to 25 dBA (BLM 1983). Noise from construction activity would be audible as background noise at distances of 1 mile or more. Low to no identifiable noise impact would occur from construction activities related to expansion of the Norwood Substation.

Modifications to the Nucla Substation would occur over a one and one-half month period. No sensitive receptors are located within 1,000 feet of the substation. Noise from construction activity would be audible as background noise at distances of one mile or more. Low to no identification noise impact is anticipated due to the lack of nearby sensitive receptors.

69 kV Transmission Line and Distribution System Effects

Under this alternative, the 69 kV line would be upgraded to 115 kV. Approximately one mile of the 115 kV line would also be underbuilt with distribution to maintain service to SMPA's customers. No additional noise impacts are anticipated during the short construction period beyond those described previously for the 115 kV system.

Nucla-Norwood Central Alternative

115 kV Transmission Line Effects

A total of 170 structures would be installed. The poles would be set using mostly conventional construction methods, either by improving existing roads or overland construction. Helicopter

construction would be used on 0.8 mile of the line one mile south of Redvale. The staging area for the proposed 115 kV line would be located in Norwood (Mundorff 1999: pers. comm.). The nearest sensitive land uses to the construction zones are rural residential units. ***Plate LAND-1*** shows sensitive receptors by type. Helicopter construction would produce a considerably higher noise level (70 to 94 dBA range) than conventional construction methods. Sensitive receptors in the area where helicopter construction would occur include 11 residences. These residences may experience short-term high noise impacts during helicopter construction.

There are approximately 36 residences within the corridor. Short-term construction noise may be audible to these residences, but construction would not occur at night, and due to the distance from the residences, is not expected to exceed the Colorado recommended standard for residential (55 dBA) and commercial (60 dBA) zones for more than several hours, or at most, several days. These impacts would be short-term and temporary. Noise impacts would be considered low to moderate during the construction period.

No identifiable operations or maintenance noise impacts are anticipated for this alternative as described in the Nucla-Norwood Northern Alternative discussion.

Substation Effects

The Norwood Substation effects would be the same as those discussed for the Nucla-Norwood Northern Alternative.

69 kV Transmission Line and Distribution System Effects

This alternative would entail dismantling the existing 69 kV line for 10.7 miles. Noise-related impacts would be low and short-term in duration, except when helicopters are used for dismantling the line. Short-term high impacts would occur during helicopter dismantling. No additional noise impacts would result from distribution system changes.

Nucla-Norwood Southern Alternative

115 kV Transmission Line Effects

A total of 135 structures would be installed. The poles would be set using mostly conventional construction methods, either by improving existing roads or using overland construction. Helicopter construction would be used on 1.7 miles of the route in the vicinity of Naturita Canyon. The staging area for the proposed 115 kV line would be located in Norwood (S. Mundorff 1999: pers. comm.). The nearest sensitive land uses to the construction zones are rural residential units. ***Plate LAND-1*** shows sensitive receptors by type. Helicopter construction would produce a considerably higher noise level than conventional construction methods. Sensitive receptors in the area where helicopter construction would occur includes 1 residence in close proximity to the right-of-way and 15 additional residences within 1.0 mile of helicopter construction. Public lands that are used primarily by local residents for dispersed recreational pursuits (*e.g.* fishing, hiking, wildlife viewing, etc.) are located near Naturita Canyon. These residences and public lands may experience short-term high noise impacts during helicopter construction.

There are approximately 12 residences within the corridor. Short-term construction noise may be audible to these residences, but construction would not occur at night, and is not expected to exceed the Colorado recommended standard for residential (55 dBA) and commercial (60 dBA) zones for more than several hours, or at most, several days. These impacts would be

short-term and temporary. Noise impacts would be considered low to moderate during the construction period.

No identifiable operations or maintenance noise impacts are anticipated for this alternative as described in the Nucla-Norwood Northern Alternative discussion.

Substation Effects

The Norwood Substation effects would be similar to those discussed for the Nucla-Norwood Northern Alternative.

69 kV Transmission Line and Distribution System Effects

Removal of approximately 15.3 miles of the 69 kV transmission line would result in low noise impacts, except when helicopters are used for dismantling the line. Short-term, high impacts would occur during helicopter dismantling. Noise impacts would occur in residential areas where utility equipment and personnel would be present during the dismantling operations. One mile of the 69 kV line would be retained for distribution purposes. No identifiable noise impacts are anticipated with this section.

Norwood-Sunshine Alternative

115 kV Transmission Line Effects

A total of 325 structures would be installed. The poles would be set using mostly conventional construction methods, either by improving existing roads or using overland construction. Helicopter construction would be used on 4.2 miles of the route, primarily between Specie Mesa to near Wilson Mesa across Fall Creek Road, and from Sunshine Mesa to the South Fork Road. The staging areas for the proposed 115 kV line would be located in Norwood and Wilson Mesa (S. Mundorff 1999: pers. comm.). The nearest sensitive land uses to the construction zones are rural residential units and one recreation site. ***Plate LAND-1*** shows sensitive receptors by type. There are approximately 46 residences within the corridor. Short-term construction noise may be audible to these residences. Construction would not occur at night, and noise is not expected to exceed the Colorado recommended standard for residential (55 dBA) and commercial (60 dBA) zones for more than several hours, or at most, several days. These impacts would be short-term and temporary. Noise impacts would be considered low to moderate during the construction period. Helicopter construction would produce a considerably higher noise level than conventional construction methods. Sensitive receptors in the areas where helicopter construction would occur include 46 residences within the corridor and one recreation site. These residences and public resources may experience short-term high noise impacts during helicopter construction.

Substation Effects

Enlarging the Sunshine Substation would require a construction period of three months. One residence within 600 feet of the substation would experience moderate impacts during this construction period.

Dismantling the Oak Hill Substation and making minor modifications to the Wilson Mesa and Specie Mesa Substations would have low to no identifiable impacts on surrounding sensitive receptors. One rural residence is located within 600 feet of the Specie Mesa Substation and would experience low to moderate noise impacts from construction activities. Sensitive receptors at the Oak Hill and Wilson Mesa Substations are located more than 1,000 feet from

the construction activity. However, noise from construction activity would be audible as background noise at distances of one mile or more.

69 kV Transmission Line and Distribution System Effects

Under this alternative, the 69 kV line would be upgraded to 115 kV. As such, no additional noise impacts, over those reported for the 115 kV system, would occur.

Low to no identifiable noise impacts would occur from distribution line modifications, except in the area of Sunshine Mesa, where one residence would experience construction noise from the undergrounding of a distribution line just east of the Sunshine Substation. A moderate noise impact would be sustained during undergrounding of this section of distribution line.

Norwood-Telluride Alternative

115 kV Transmission Line Effects

A total of 340 structures would be installed. The poles would be set using mostly conventional construction methods, either by improving existing roads or using overland construction. Helicopter construction would be used on 7.0 miles of the route, primarily from Fall Creek Road east over the San Miguel River corridor. Two staging areas for the proposed 115 kV line would be used: one located near Norwood and one located on Wilson Mesa (S. Mundorff 1999: pers. comm.). The nearest sensitive land uses to the construction zones are single family and multi-family residential units, recreation sites, a school, commercial, and industrial sites. ***Plates LAND-1, REC-1*** and ***REC-2*** show sensitive receptors by type. Helicopter construction would produce a considerably higher noise level than conventional construction methods. Sensitive receptors in areas where helicopter construction would occur include seven residences, one school, and public lands in the vicinity of the San Miguel River Canyon that are used extensively for dispersed recreation. In addition, recreation resources in the surrounding study area that would be impacted by helicopter construction noise include the Mt. Sneffels Wilderness Area, the Last Dollar Road, the Last Dollar hut, and other resources which provide primitive recreation opportunities. These residences and recreation resources may experience short-term high noise impacts during helicopter construction

There are approximately 39 residences within the corridor. Short- term construction noise may be audible to these residences, but construction would not occur at night, and is not expected to exceed the Colorado recommended standard for residential (55 dBA) and commercial (60 dBA) zones for more than several hours, or at most several days. These impacts would be short-term and temporary. Noise impacts would be considered low to moderate during the construction period.

No identifiable operations or maintenance noise impacts are anticipated as described in the Nucla-Norwood Northern Alternative discussion.

Substation Effects

Construction personnel and equipment associated with modifications to the Telluride and Specie Mesa Substations are summarized in *Table A-2.3-4* and in Appendix A, Section 2.3.2 (Construction of Substation Facilities). The equipment staging area for the substation construction would be located in Telluride (S. Mundorff 1999: pers. comm.). The construction period for the Telluride Substation is estimated at 2-½ months, from mid-June through August. The closest multi-family residential sensitive receptor to the Telluride Substation is more than 1,000 feet from the site. Noise levels inside residences or other sensitive receptors near con-

struction activity would be much lower, as outside walls typically reduce high-frequency noise levels by 20 to 25 dBA (BLM 1983). Noise from construction activity would be audible as background noise at distances of 1 mile or more. Since the substation is already located in an industrial area, low noise impacts would occur from construction activities related to modification of the Telluride Substation.

Modifications to the Specie Mesa Substation and dismantling of the Oak Hill and Wilson Mesa Substations would have low to no identifiable noise impact. One rural residence is located within 500 feet of the Specie Mesa Substation and would experience low to moderate noise impacts from construction activities. Sensitive receptors at the Oak Hill and Wilson Mesa Substations are located more than 1,000 feet from the construction activity. However, noise from construction activity would be audible as background noise at distances of one mile or more.

69 kV Transmission Line and Distribution System Effects

Removal of a portion of the 69 kV transmission line would result in no identifiable to low impacts, except when helicopters are used for dismantling the line. Short-term high impacts would occur during helicopter dismantling. Impacts would occur near residences on Specie Mesa and Wilson Mesa. Utility personnel, vehicles and equipment would be audible for a short time during the dismantling operations.

Moderate noise impacts would result from the undergrounding of a one-mile section of distribution line just west of the Telluride Substation. The construction schedule for undergrounding lines is between 1 ½ to 2 months. The section of line extending west of the Telluride Substation would be particularly difficult due to rugged terrain and would require several weeks to complete. Construction noise would be considered moderate due to the location of multi-family and single family residential developments (affordable housing in Ilium Valley and Lawson Hill) and recreational resources (Galloping Goose Trail, San Miguel River, Mary E Primitive Campground, South Fork River) in close proximity to the undergrounding. However, topographical contours would help to minimize some of these noise impacts. The noise during construction would be sustained throughout the day.

3.13.2.3 IMPACTS OF THE SUBALTERNATIVES

115 kV Transmission Line Routing Alternatives

Subalternative A Subalternative A would have similar low to moderate noise impacts as described for the Nucla-Norwood Southern Alternative. Helicopter construction within Naturita Canyon would be short-term and temporary; however, impacts to wildlife and dispersed recreationists would occur within the canyon. These impacts would be considered short-term, but high noise impacts.

Subalternative B Short-term noise impacts of Subalternative B would be similar to any of the Nucla-Norwood alternatives. Noise impacts would be moderate during the short-term construction phase, for residences located within the Fitts (Hillside) Subdivision.

Subalternative C would improve the short-term noise impacts described for the alternatives by minimizing the number of impacted sensitive receptors in the Fitts Subdivision. Noise impacts would affect fewer residences and would be considered moderate in degree.

Subalternative D This subalternative would have no identifiable noise impact.

Subalternative E Subalternative E would have similar low to moderate short-term noise impacts as described for the Norwood-Telluride Alternative. Noise receptors would primarily be persons engaged in dispersed recreation along the San Miguel River.

UNDERGROUND SUBALTERNATIVE

The Underground Subalternative would have short-term temporary noise impacts on the residents located near the existing line on Specie, Wilson and Sunshine Mesas. These impacts would be intermittent and not significant. Short-term impacts could result from both blasting and construction equipment and crews.

NORWOOD SUBSTATION ALTERNATIVE SITE

The Norwood Substation Alternative would minimize the duration of noise impacts that would occur to sensitive receptors near the existing substation during the construction period. Fewer sensitive receptors would be affected at the new site. Noise impacts would be considered low to moderate for the one residence within 1,000 feet of the new site during construction. Short-term noise impacts would result at the existing substation during dismantling operations, which could last one to two months (S. Mundorff 1999: pers. comm.).

3.13.2.4 CUMULATIVE EFFECTS

Construction of the Telluride Ski Area, continued development at Mountain Village and Telluride, and the San Miguel Hydroelectric project, if developed simultaneously with the proposed Norwood-Telluride Project, would contribute to the overall construction noise within the project area. Noise impacts would move from low to moderate for the short-term construction period to a high noise level sustained for longer periods of time. SMPA's construction of the Specie and/or Wilson Mesa Substation during the same timeframe as the 115 kV transmission line could also cause cumulative noise impacts from construction equipment, vehicles and activities on Wilson and/or Specie Mesas. Cumulative noise impacts on Specie Mesa would pertain to either the Norwood-Sunshine or Norwood-Telluride Alternatives. Cumulative noise effects on Wilson Mesa would pertain to the Norwood-Sunshine Alternative only.

3.13.2.5 POTENTIAL MITIGATION MEASURES AND RESIDUAL EFFECTS

The EPMs identified earlier would help to reduce noise impacts. No noise impact residual effects are anticipated for any of the alternatives.

3.13.2.6 IMPACTS OF THE GENERATION ALTERNATIVES

Noise emitted from the generator alternatives could vary from 85 dBA for the Small Generator and Emergency Generator scenarios (the Solar Titan 130) to 95 dBA for the Large Generator Alternative (GE Frame 6B) (AESC 2000). Key to public safety is the noise levels that would occur at a generator facility fence line. *Figure 3.13-1* shows the anticipated noise levels that both types of generators would have at fence line distances. The Large Generator Alternative would potentially exceed the State's noise standards for commercial premises, while the Small and Emergency Generator scenarios would meet the state's noise standard. All the generator scenarios would meet the State's noise standards for Industrial Premises.

3.13.2.7 NO ACTION ALTERNATIVE

The No Action Alternative would generate no new noise within the project area over the existing situation. Routine maintenance of the existing 69 kV transmission line and substations would continue in the current pattern and increase over time, as additional maintenance of the 69 kV line would be required. As the 69 kV line continues to degrade, long-term corona noise may increase.

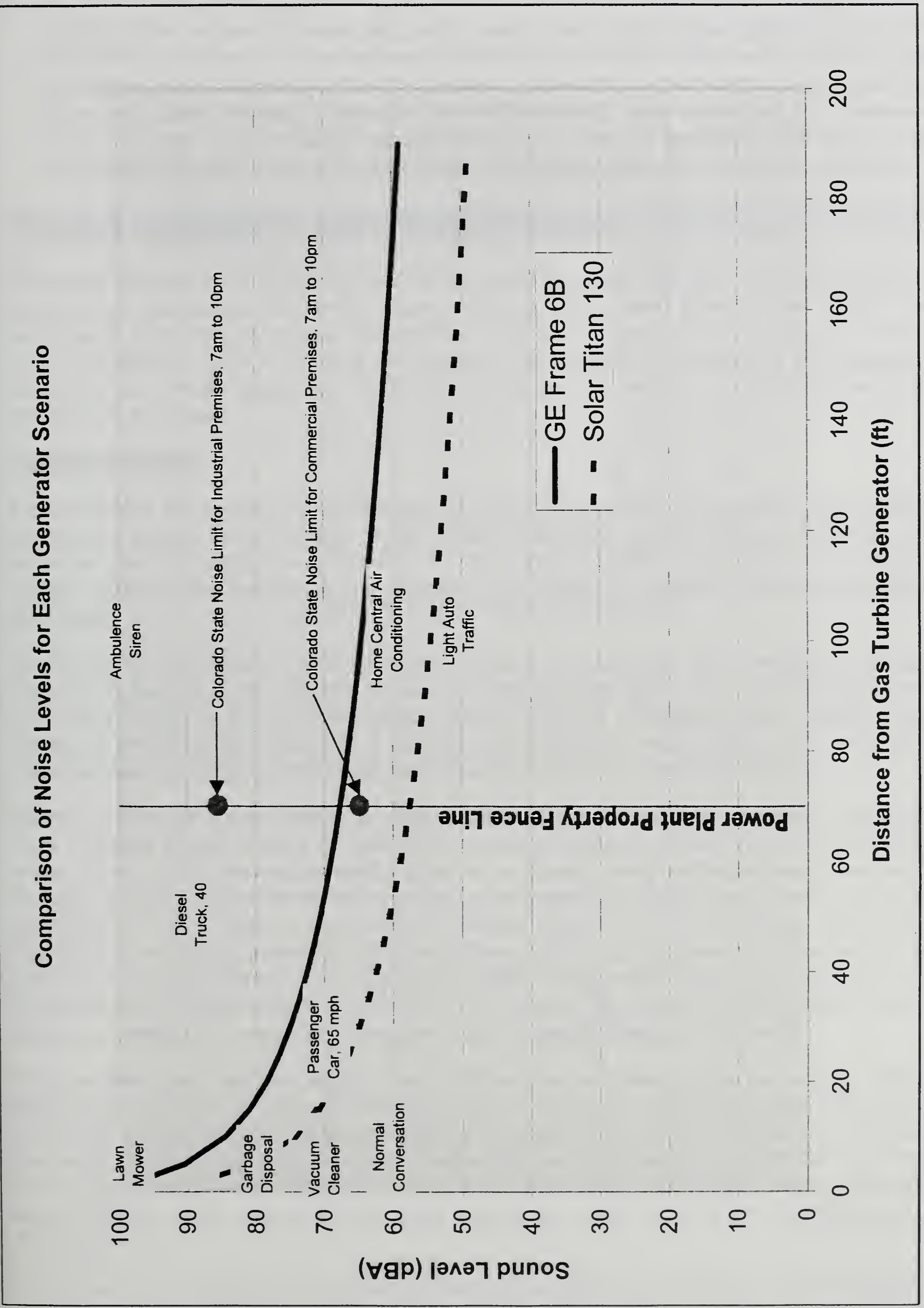

Figure 3.13-1 - Comparison of Generator Noise to Typical Sources & State Regulations
("Typical Sounds" from National Park Service Website, http://www.nps.gov/planning/samo/cala/tbl6-29.htm.)

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3.14 HUMAN HEALTH AND SAFETY

ISSUES: This section discusses the public health and safety-related effects of the project alternatives, including the Transmission Alternatives, Generation Alternatives and No Action Alternative. Issues addressed for the Transmission Alternatives include electric and magnetic field effects and related hazards. Generation Alternative-related issues encompass the transmission concerns as well as public health and safety risks at or near the generators. For the No Action Alternative, the public health and safety ramifications of potential power outages are disclosed.

3.14.1 AFFECTED ENVIRONMENT

Overhead transmission lines are part of the electric supply system that provides service to homes and businesses. In recent years, interest has grown about what effects may be associated with the electrical environment around electric power lines, in particular, potential health effects of electric and magnetic fields (EMFs) associated with transmission lines. Because these issues are technically complex, this section summarizes and explains the factors involved.

ELECTRIC FIELDS

Electric fields are caused by the voltage (electrical pressure) on an object. Any object with an electric charge has a voltage at its surface that is caused by the accumulation of electrons, or their stripping away relative to the normal number comprising the material. The voltage effect is not limited to the surface of an object but exists in the space surrounding the object.

Electric fields can exert a force on other charges at a distance. The change in voltage over distance is known as the electric field. The units describing electric field strength are volts per meter (V/m) or kilovolts per meter (kV/m). This is a measure of the rate of change in electrical potential or voltage over distance expressed in metric units. The electric field is stronger near a charged object and decreases with distance from the object.

Electric fields are a very common phenomenon. They can be near constant (static) or vary over a period of one second or less. Static electric fields can result from friction generated when taking off a sweater or walking across a carpet. Body voltages have been measured as high as 16 kV due to static electric fields generated by walking on a carpet (Chakravarti and Pontrelli 1976). Also, a normal fair-weather static field occurs around the earth due to the 300 kV to 400 kV potential difference between the ionosphere and the earth's surface (Veimeister 1972; Merrill and McElhinny 1983). At ground level, the mean value of the field strength is approximately 120 V/m. This means that a six-foot tall person would have a static potential of about 220 V between the top and bottom of their body.

This normal, fair weather static electric field varies from month to month, reaching a maximum of about 20 percent above normal in January (when the earth is closest to the sun), and falling to about 20 percent below normal by July (when the earth is farthest from the sun). Much stronger static electric potentials can exist beneath storm clouds, where the electric potential (with respect to earth) can reach 10 to 100 million volts. Natural static electric fields under clouds and in dust storms can reach 3 to 10 kV/m (Chakravarti and Pontrelli 1976).

All household appliances and other devices that operate on electricity create electric fields. However, these fields are different from the earth's static or direct current (DC) field. Fields produced by electrical appliances reverse direction at a rate of 120 times per second

[60 Hz (Hertz or cycles per second)] because of the alternating current (AC) used to operate them. The electric field in this case is caused by the changing electrocurrent and voltage in the appliance, and the field decreases rapidly with distance from the device. The field caused by point-source (small-dimension) household appliances generally decreases more rapidly with distance than line-source fields (such as from power lines). Appliances need not be in operation to create an electric field. Just plugging an appliance into an electrical outlet creates an electric field around it. Typical values measured one foot away from some common appliances are shown in *Table 3.14-1*.

Table 3.14-1
Typical Electric Field Values for Appliances, at 12 Inches

Appliance	Electric Field Strength (kV/m)
Electric Blanket	0.25*
Broiler	0.13
Stereo	0.09
Refrigerator	0.06
Iron	0.06
Hand Mixer	0.05
Coffee Pot	0.03

** 1 to 10 kV/m next to blanket wires (Enertech 1985)*

Transmission Lines. Similar to appliances, electric transmission lines also have 60 Hz electric fields. These fields result from the combined voltage of the transmission line phase conductors with respect to the ground. Electric field strengths for a transmission line remain nearly constant over time because the voltage of the line is kept within bounds of about ±5 percent of its rated voltage. Electric field strengths from a transmission line decrease with distance away from the outermost conductor, typically at a rate of approximately one divided by the distance squared ($1/d^2$). As an example, if the electric field strength is 10 kV/m at a distance of 1.0 meter away, it will be approximately 2.5 kV/m at 2.0 meters away, and 0.63 kV/m at 4.0 meters away. Electric fields from transmission lines are also typically reduced to a substantial degree by surrounding structures and nearby trees and shrubbery.

Substations. Electric power substations also create electric fields. The equipment, or components of a substation, acts as point-sources of electric fields, similar to appliances in a home. As the distance from these point-sources becomes greater than the physical size of the piece of equipment acting as a source, the fields are greatly reduced; this is also true for substation components such as bus work. The electric fields from a substation decrease at a rate of approximately one divided by the distance away from the substation cubed ($1/d^3$). For example, a field of 1 kV/m at 50 meters away from a substation would be approximately 0.125 kV/m at 100 meters away, and 0.016 kV/m at 200 meters away. Substation electric fields outside the fenced area are typically very low because of shielding by metallic substation components themselves, as well as by the metal fencing surrounding the substation. Additional shielding can be provided by nearby shrubbery and trees.

MAGNETIC FIELDS

An electric current flowing in a conductor (electric equipment, household appliance, power circuits, etc.) creates a magnetic field. The most commonly used magnetic field intensity unit of measure is the gauss. For convenience in reporting magnetic field magnitudes, the unit of milligauss (mG) is used, which is one thousandth of a gauss. As a refer-

ence, the earth has a natural static direct current (DC) magnetic field of about 0.520 gauss, or 520 mG (Merrill and McElhinney 1983). As with electric fields, the magnetic fields from power circuits and appliances differ from static (or DC) fields because they are caused by the flow of 60 Hz alternating currents. Power frequency magnetic fields also reverse direction at a rate of 120 times per second corresponding to the 60 Hz operating frequency of the power systems in the United States.

Since the magnetic field is caused by the flow of an electric current, a device must be operated to create a magnetic field. Magnetic field strengths of a large number of common household appliances were measured by the Illinois Institute of Technology Research (IITR) for the U.S. Navy, and by Enertech Consultants for the Electric Power Research Institute (EPRI) (Gauger 1985; Silva et al. 1989). Typical field values for these appliances are presented in Table 3.14-2 to facilitate a better understanding of magnetic field strength values. The Enertech study for EPRI also found that mean resultant magnetic field strengths in residential homes are approximately 0.9 mG at about 1.0 meter above ground level (Silva, et al. 1989).

Table 3.14-2
Magnetic Fields From Household Appliances

Appliance	Magnetic Field (mG)	
	12" Distant	Maximum
Electric Range	3 to 30	100 to 1,200
Electric Oven	2 to 25	10 to 50
Garbage.Disposal	10 to 20	850 to 1,250
Refrigerator	0.3 to 3	4 to 15
Clothes Washer	2 to 30	10 to 400
Clothes Dryer	1 to 3	3 to 80
Coffee Maker	0.8 to 1	15 to 250
Toaster	0.6 to 8	70 to 150
Crock Pot	0.8 to 1	15 to 80
Iron	1 to 3	90 to 300
Can Opener	35 to 250	10,000 to 20,000
Mixer	6 to 100	500 to 7,000
Blender, Popper, Processor	6 to 20	250 to 1,050
Vacuum Cleaner	20 to 200	2,000 to 8,000
Portable Heater	1 to 40	100 to 1,100
Fans/blowers	0.4 to 40	20 to 300
Hair Dryer	1 to 70	60 to 20,000
Electric Shaver	1 to 100	150 to 15,000
Color TV	9 to 20	150 to 500
Fluorescent Fixture	2 to 40	140 to 2,000
Fluorescent Desk Lamp	6 to 20	400 to 3,500
Circular Saws	10 to 250	2,000 to 10,000
Electric Drill	25 to 35	4,000 to 8,000

Source: Gauger 1985

Magnetic field strength is affected by the distance from the source of the field, and the configuration of the source conductors. The magnetic field of an appliance decreases rapidly with distance away from the device. The magnetic field also decreases with distance away from line sources, such as transmission lines, but not as rapidly as it does from appliances. Magnetic fields from transmission lines are reduced at a rate of about one di-

vided by the distance squared ($1/d^2$), whereas magnetic fields from appliances are reduced at a rate of about one divided by the distance cubed ($1/d^3$).

Unlike electric fields, which are easily shielded by common conductive objects, magnetic fields cannot easily be shielded. Most materials (such as those that make up buildings, trees, and the ground) do not effectively shield magnetic fields. Certain ferromagnetic materials (i.e., those containing iron, nickel, or cobalt) have properties that, when placed in the proper orientation and location, can shield fields. Eddy currents are induced in highly conductive metal used in conductive shielding and cancel the imposed magnetic field. Ferromagnetic materials shield by concentrating and redirecting magnetic flux within the body of the material.

Transmission Lines. Transmission line magnetic fields are generated by the current flowing through the conductors. Similar to the electric field, field strengths decrease with distance away from the line. Unlike static electric fields, the 60 Hz magnetic fields are not constant over time because the current on any power line changes in response to increasing and decreasing electrical load.

Substations. Substation magnetic field decreases due to distance are similar to those for electric fields. Because a substation is a collection of components that can each be a magnetic field source, a substation complex is often treated as a single point-source for external field measurements. External magnetic fields associated with the substation (e.g., the collection of components) can be considered separately from the magnetic fields associated with the power lines that serve the substation. In most instances, the manner in which substation component magnetic fields decrease with distance is similar to that from appliances, where the field strengths diminish rapidly as the distance from the source grows larger than the dimensions of the source itself (for example, a transformer), and at distances on the order of 50 feet or more from the substation fence, the external field will have decreased to a much lower level than the level inside the substation. However, some substation components can be strong sources of magnetic fields and with certain designs, a substation can likewise be a substantial source. In contrast to electric fields, the substation magnetic fields are not affected significantly (shielded) by most common objects.

CORONA

Corona is a phenomena associated with highly energized devices, including high voltage powerlines. Corona is a luminous discharge associated with ionization of air next to a source of high voltage. Corona is one physical manifestation of energy loss, and can transform energy into very small amounts of light, sound, radio, noise, chemical reaction, and heat. Because power loss in uneconomical on transmission lines, corona has been studied since the early part of this century. Consequently, it is well understood by engineers, and steps are taken to minimize it in line design.

3.14.2 ENVIRONMENTAL CONSEQUENCES

3.14.2.1 ANALYTICAL FRAMEWORK

POTENTIAL TYPES OF IMPACTS

This section of the EIS addresses the potential for public health risks from the proposed 115 kV transmission line Project due to electric and magnetic fields (EMF). Other public concerns related to EMF include electric and magnetic field effects on agriculture and livestock; induced shocks; effects on cardiac pacemakers; corona effects including audible noise and interference with radio and television; and fire risks. These types of issues are common to all the Transmission Alternatives. Public health concerns for the Generation

Alternatives include the transmission line EMF-related issues noted above, since modifications would still be made to the existing transmission systems with the generation scenarios. Additional public health issues for the Generation Alternatives may include ice fog, gas turbine engine fires, electric generator fires, electrical faults, fuel tank leaks, lubrication fluid spills or catastrophic structural failure of high speed rotating equipment. All of these risks, with the exception of ice fog, can be mitigated with proper maintenance, sensors, professional construction, operating practices and fire suppression equipment. The potential public health and safety issues associated with power outages from the No Action Alternative are subsequently presented at the conclusion of this section.

Applicable Permits, Standards and Authorizations

The proposed line would be constructed to meet or exceed the National Electrical Safety Code (NESC). NESC standards address mechanical strength and electrical clearance issues. There are currently no Federal standards limiting EMFs from transmission line or substation facilities. The Colorado Public Utilities Commission has adopted Rule 18(j) that sets forth prudent avoidance guidelines for electric power lines. Rule 18(j) defines prudent avoidance as "the striking of a reasonable balance between the potential health effects of exposure to magnetic fields and the cost and impact of mitigation of such exposure, by taking steps to reduce the exposure at reasonable or modest cost.

3.14.2.2 IMPACTS COMMON AMONG THE TRANSMISSION ALTERNATIVES

The question of whether long-term direct exposure to the electric and magnetic fields from transmission lines cause biological or health effects in humans is a controversial subject. In 1991, Congress (Public Law 102-104) designated the U.S. Department of Energy (DOE) as the lead agency for electric and magnetic field research and specified that DOE enter into an agreement with the National Research Council (NRC) to conduct an evaluation of the possible health effects of electric and magnetic fields. After almost three years of study by an expert committee convened by the NRC and numerous hours of committee deliberations, the NRC issued its report, *Possible Health Effects of Exposure to Residential Electric and Magnetic Fields* (NRC 1997). The conclusions of the committee are summarized in the report (page 1) as follows:

> *Based on a comprehensive evaluation of published studies relating to the effects of power-frequency electric and magnetic fields on cells, tissues, and organisms (including humans), the conclusion of the committee is that the current body of evidence does not show that exposure to these fields presents a human health hazard. Specifically, no conclusive and consistent evidence shows that exposures to residential electric and magnetic fields produce cancer, adverse neurobehavioral effects, or reproductive and developmental effects.*
>
> *The committee reviewed residential exposure levels to electric and magnetic fields, evaluated the available epidemiologic studies, and examined laboratory investigations that used cells, isolated tissues, and animals. At exposure levels well above those normally encountered in residences, electric and magnetic fields can produce biological effects (promotion of bone healing is an example), but these effects do not provide a consistent picture of a relationship between the biological effects of these fields and health hazards. An association between residential wiring configurations (called wire codes, defined below) and childhood leukemia persists in multiple studies, although the causative factor responsible for that statistical association has not been identified. No evidence links contemporary measurements of magnetic-field levels to childhood leukemia.*

[A wire code is a surrogate means of assessing electric- and magnetic-field exposure and classifying homes on the basis of well-defined wiring configurations. Wire codes have been employed in epidemiologic studies because measuring residential fields for large numbers of homes over historical periods of interest is logistically difficult, time consuming, and expensive (NRC 1997).]

A recent study has been published in the New England Journal of Medicine, (Linet et al. 1997), regarding the possible link between EMF exposure and childhood leukemia. This comprehensive, $5 million/5 year study indicated no linkage between EMF and childhood leukemia. A summary of other research findings is contained in Appendix C.

In conclusion, in no case has a specific deleterious effect to human health been identified from exposure to transmission line fields. Over most of the ROW, the electric field would be below the perception level for humans. Anticipated use of the ROW is transitory. Both electric and magnetic fields from the proposed line outside the ROW would be comparable with levels of magnetic fields measured close to some common household appliances. Operational experience over several decades with 115 kV and higher voltage transmission lines has indicated no adverse biological or health effects related to electric or magnetic field exposure. The current state of epidemiological and laboratory evidence is not sufficient to support a conclusion that the proposed transmission line poses any adverse health or biological effects. Therefore, the electric and magnetic fields of the Project are not anticipated to cause adverse health or biological effects.

Electric Field Effects

The unperturbed electric field at a height of one meter, or 3.3 feet, above the ground is used to describe the field under transmission lines. The electric field level is expressed in units of kilo volts per meter (kV/m) and is easily measured or calculated. The most important parameters for determining the ground level electric field of a transmission line are conductor height above ground, line voltage, and phasing of the conductors. The values of the electric fields are shown in ***Figure 3.14-1***. The fields under the proposed line will be 1.4 kV/m directly beneath the line while this will drop to 0.4 kV/m at the edge of the right of way. The corresponding values for the existing 69 kV line are 0.4 and 0.15 kV/m.

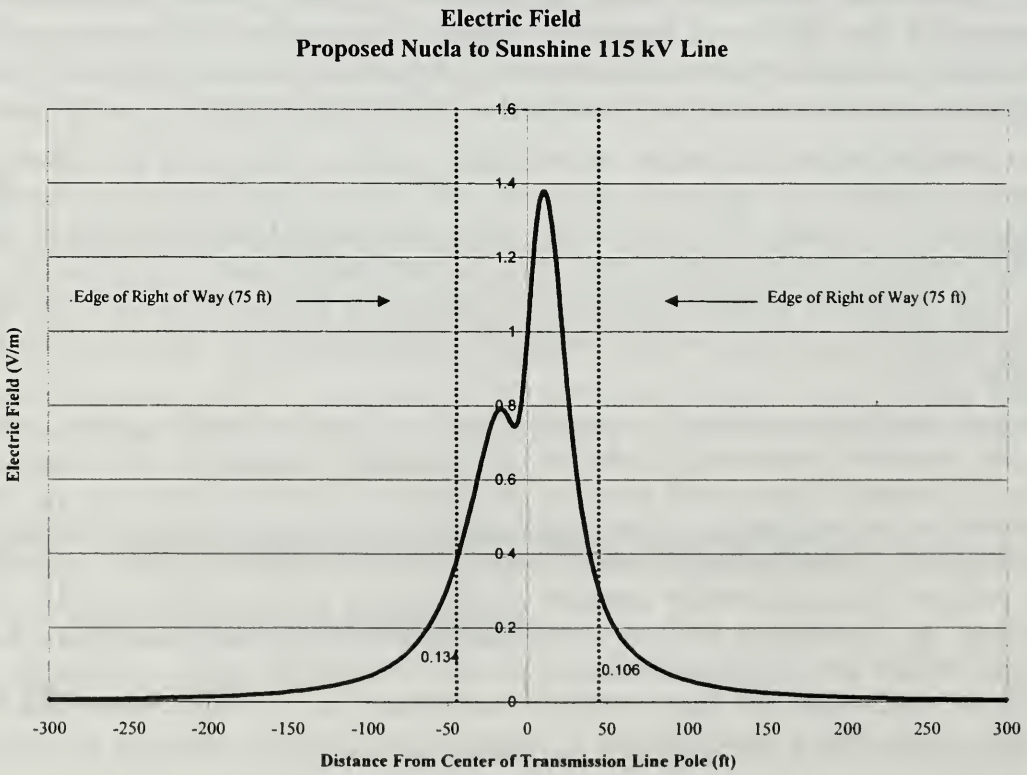

Figure 3.14-1
Profiles of electric fields for existing and proposed lines.

Effects on Agriculture and Livestock

High electric fields (115 kV/m) have been observed to induce corona on the upper most parts of plants (McKee et al. 1978; Rogers et al. 1982). The induced corona causes minor damage to leaf tips. Studies of the effects of electric fields on crops and other plants have been conducted under controlled greenhouse conditions and under transmission lines. The effects of 60 Hz electric fields on plants is limited to corona damage at sharp terminal plant parts in very high levels of electric fields. This effect is too limited to be noticeable under field conditions found under operating transmission lines and does not result in crop damage. The electric fields associated with the proposed line are well below levels where the leaf tip corona phenomenon has been observed. No damage or harm to crops would occur due to the fields under the proposed line.

Numerous studies have investigated the performance of livestock in the electrical environment of high voltage AC transmission lines. There are no indications that exposures to the fields beneath operating transmission lines affect livestock behavior or productivity. However, metal water and feed troughs, fences, and other conducting objects under the proposed line, should be grounded to eliminate the possibility of nuisance shocks.

Effects on Cardiac Pacemakers

An area of concern related to electric fields (generally for lines of 345 kV and larger) has been the possibility of interference with cardiac pacemakers. There are two general types of pacemakers: asynchronous and synchronous. The asynchronous pacemaker pulses at a predetermined rate. It is practically immune to interference because it has no sensing circuitry and is not exceptionally complex. The synchronous pacemaker, however, pulses only when its sensing circuitry determines that pacing is necessary. Interference from the transmission line electric field may cause a spurious signal on the pacemaker's sensing circuitry. However, when these pacemakers detect a spurious signal, such as a 60 Hz signal, they are programmed to revert to an asynchronous or fixed pacing mode of operation, returning to synchronous operation within a specified time after the signal is no longer detected. Cardiovascular specialists do not consider prolonged asynchronous pacing a problem. In fact, periods of operation in this mode are commonly induced by cardiologists to check pacemaker performance. So, while the transmission line electric field may interfere with the normal operation of some of the older model pacemakers, the result of the interference is generally not harmful, and is of short duration (EPRI 1985 and 1979).

Hazards

All electrical facilities, including transmission lines, pose a risk of injury to the general public due to the hazard of electric shocks. Shocks can occur when objects or people come in close proximity to energized transmission lines conductors. Direct contact with a conductor is not necessary to get a shock, especially at transmission line voltages. When grounded objects come close to energized conductors, the electricity can "jump" from the conductor to a grounded object. However, NESC guidelines for safe ground clearances are designed to protect the public from this hazard.

The greatest hazard from a transmission line is direct electrical contact with the conductors at any voltage. In fact, contact is more likely with lower voltage transmission lines, because of their lower clearance compared to higher voltage lines. Physical contact between a grounded object and the high voltage conductors is not necessary for electrical contact to be made. Arcing can occur across an air gap.

Extreme caution must be used when operating tall equipment, such as cranes or drilling equipment, near the line. Irrigation pipes and systems cannot be tipped up near the line. Trees near the transmission line should not be felled onto the conductors. Kites should not

be flown near transmission lines and only nonmetallic string and kites should be used on dry days. The wind should carry the kite away from the transmission line. Poles should not be climbed. If there is adequate clearance to the conductors of the proposed transmission line, then normal agricultural and other activities can be carried on safely.

Steady streams of water contacting the energized conductors can provide a direct path to ground for leakage current or a flashover. Therefore, precautions should be taken to prevent steady water streams from striking the conductors. If this does happen, one should avoid contacting or being near the irrigation system. Thus, when a steady stream of water reaches a conductor, the water should be turned off at its source before correcting the problem. Nozzle risers in the vicinity of transmission lines should be equipped with spoilers or automatic shutoffs. High-volume, high-pressure systems have the potential to send a steady stream considerable distances. Safe operating distances for this type of equipment are based on several factors, including nozzle diameter and line voltage. Information is available to determine safe distances for this type of equipment. Cooperation between the landowner and the operator of the transmission line is essential for safe operation.

Large fires near transmission lines represent a potential electrical hazard. The hot gases and smoke can create a conductive path to ground. If a flashover occurs along this path, then people near the fire could possibly experience dangerous shocks. Flashover also causes outages and jeopardizes the reliability of the transmission system. Because of the hazards associated with fires, storing flammables, constructing flammable structures, and other activities that have the potential to cause or provide fuel for fires on rights-of-way would be prohibited. The presence of an overhead transmission line eliminates the use of management ignited controlled burns adjacent to or near the line to achieve management objectives such as hazardous fuel reduction or wildlife habitat improvements. In most cases mechanical treatments can be used to meet the same objectives, but usually at a higher cost.

This may also be a factor in the BLM fire management plan for the Uncompahgre Field Office since they plan to fight some wild fires more aggressively than others. The execution of the fire management plan should take into account the concern for having a fire burning near the transmission line and the possibility of a flashover or physical damage to the wooden pole structures from the fire.

Use of explosives on or near the right-of-way can be affected by electrical interference from the power line to the circuits used for detonation. There is also a potential for damage to the transmission system.

Transmission line poles, wires, and other tall objects are the most likely points to be hit by lightning during a thunderstorm. The proposed Project would be designed with the overhead ground wires and well-grounded towers to protect the system from lightning. When the overhead ground wire or tower is hit, the lightning strike is conducted to ground at the tower. Since it is hazardous to be in the area where lightning enters the ground, it is advisable to stay away from the towers (and all tall objects such as trees) during electrical storms.

Induced current in vehicles under the line can be a concern since a person touching a vehicle can receive a shock. Mobile objects such as vehicles and farm machinery cannot be grounded permanently like a fence or building. However a vehicle can drag either a chain or other conductor; a ground strap can be attached to the vehicle when it is stopped. Also, tires tend to be conductive, farm machinery is usually in direct contact with the soil, and conducting vegetation is in contact with equipment. Because of these factors, the shock hazard from a vehicle under the line is a remote possibility.

Normal grounding policies effectively mitigate the possibility of nuisance shocks due to induced currents from stationary objects such as fences and buildings. Since the electric

field extends beyond the right-of-way, grounding requirements extend beyond the right-of-way for very large objects or extremely long fences. Electric fences require a special grounding technique because they can only operate if they are insulated. Applying the grounding policy during and after construction will effectively mitigate the potential for shocks from stationary objects near the proposed line.

In a high electric field, it is theoretically possible for a spark discharge from the induced voltage on a large vehicle to ignite gasoline vapor during refueling. However, the probability for exactly the right conditions to occur for ignition is remote. For the proposed Project, the maximum electric field is low enough that it is very doubtful the right conditions could ever be achieved. Because of the theoretical possibility of ignition, some utilities recommend that refueling not be done near transmission lines unless necessary. In the event refueling must be done under a line grounding is recommended.

Magnetic Field Effects

The magnetic field at a height of 1 meter, or 3.3 feet, above the ground is used describe the magnetic field under transmission lines. Magnetic fields beneath power lines are usually expressed in units of milligauss (mG). The most important parameters for determining the ground level magnetic field of a transmission line are conductor height above ground, the proximity of other conductors, and the current flowing in the conductors. The maximum calculated 60 Hz magnetic field directly under the proposed 115 kV line during typical average loading conditions for the proposed line is approximately 23 mG (***Figure 3.14-2***). This field would occur with the conductors at or above 27 feet above ground level (at 212° F) and under normal loading conditions (150 A). At the ROW edge under these typical conditions, the calculated magnetic field is approximately 7.5 mG. The actual level of magnetic field would vary with current loading, conductor temperature, and ground clearance. The magnetic field levels for the existing 69 kV line are 2 mG under the line and 0.45 mG at the edge of the ROW.

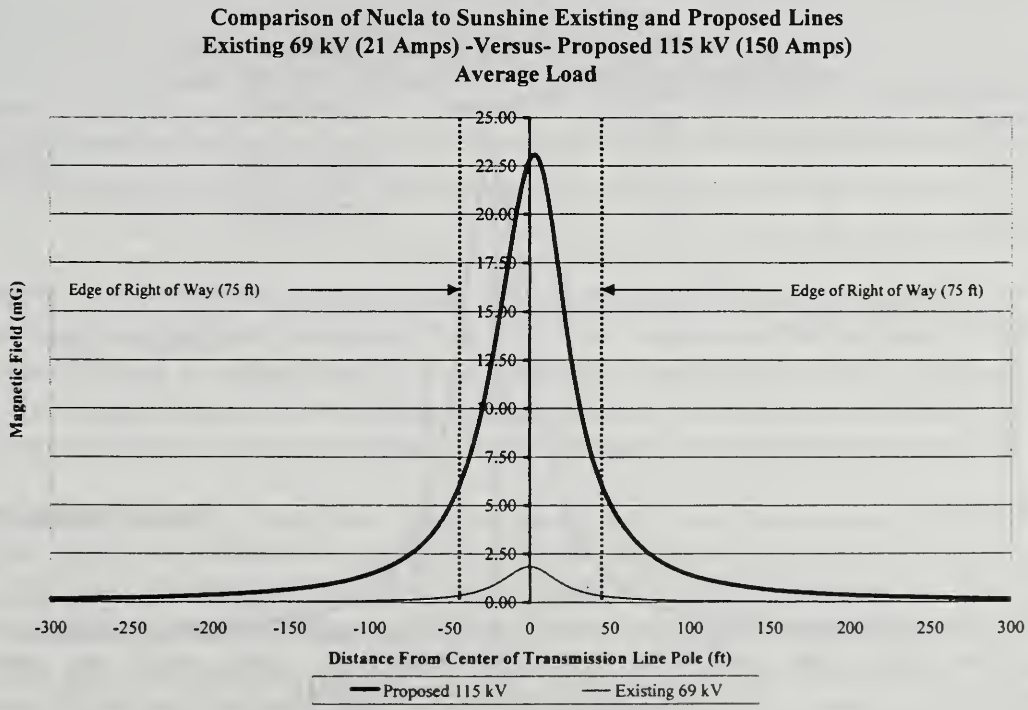

Figure 3.14-2
Average magnetic fields produced by proposed 115 kV line and existing 69 kV line.

Under temporary peak loading conditions expected to occur about one hour per year, the maximum calculated 60 Hz magnetic field for the proposed line would be 43 mG, and at

the edge of ROW approximately 14 mG (*Figure 3.14-3*). These expected levels are comparable with typical magnetic fields of other transmission lines with levels of magnetic field measured close to some household appliances (see *Table 3.14-2*). For the existing 69 kV line, these values are 3 and 0.8 mG.

UNDERGROUNDING

Electric current flowing through a conductor generates magnetic fields. For a transmission power line, three conductors are used to carry the electric current. The magnetic field produced by one conductor is partially cancelled by the magnetic fields produced by the other two conductors on the transmission line. If the conductors are separated by some distance (as they are on an overhead transmission line structure), this magnetic field cancellation is partly effective. If a transmission line is constructed underground with the three conductors placed close together in the same trench, the magnetic field cancellation is more complete and the resulting magnetic field from the underground transmission line is reduced. However, the cost of constructing the transmission line underground in this manner will be greatly increased by about seven times the cost of constructing the equivalent power line overhead as proposed.

SHOCKS CAUSED BY MAGNETICALLY INDUCED CURRENTS AND VOLTAGES

Shocks due to magnetically induced currents and voltages are of the same type as those due to electric field induced currents and voltages. In the case of magnetic induction, the voltages are generally quite low, and the currents are limited as compared to those induced by electric fields. Normally, the resistance of shoes will limit the current to levels below the threshold for perception. Mitigation measures, such as grounding and breaking electrical continuity, that are implemented for electric field induction will also mitigate magnetic field induction. As a result, it is unlikely that magnetically induced voltages and currents would have an adverse impact.

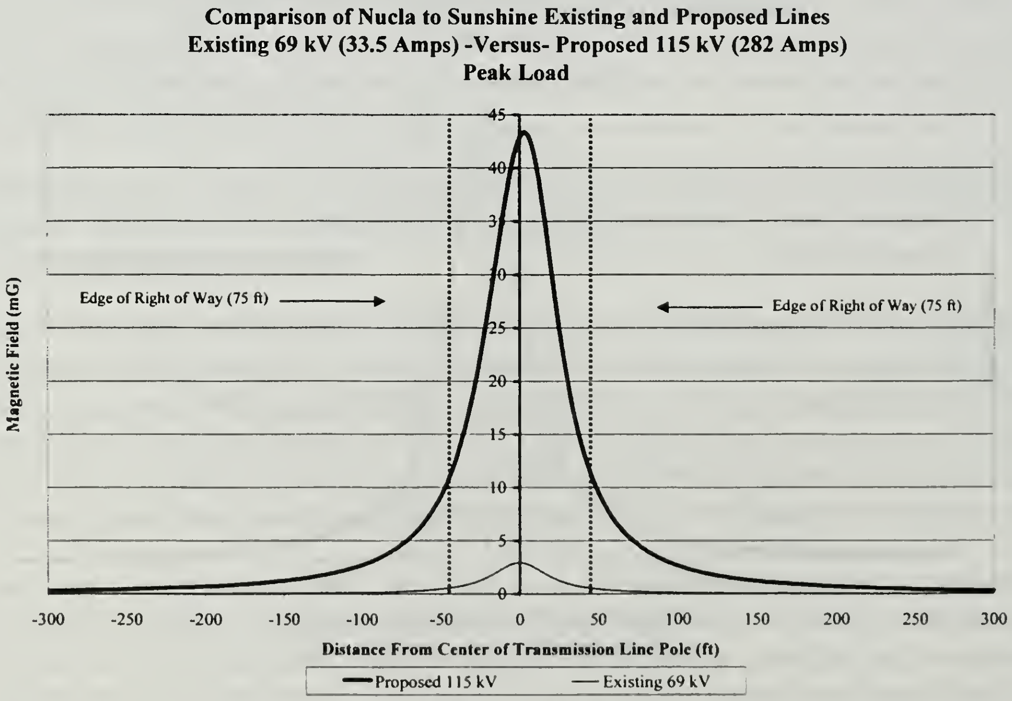

Figure 3.14-3
Peak magnetic fields produced by proposed 115 kV line and existing 69 kV line.

BIOLOGICAL EFFECTS

Initially, concern and research about possible biological effects from 60 Hz fields focused on electric fields. Magnetic fields from transmission line did not receive the same early

emphasis as electric field because magnetic fields associated with transmission lines are low level compared to levels where the effects have been observed.

As previously discussed, the laboratory and epidemiologic evidence to date has provided no consistent and conclusive evidence of a health hazard to humans from being exposed to residential electric and magnetic fields from power lines or appliances. The epidemiologic evidence from both residential and occupation studies for an association between electric and magnetic fields and cancer or the adverse affects in humans is inconclusive and does not demonstrate a casual link. Research is underway in the United States and elsewhere to provide better exposure, assessment, and other determinants in both residential and occupation studies.

Corona Effects

When significant corona activity occurs on transmission lines, it is usually on lines of 345 kV and above, and then mostly during rain or snow, or the period of high humidity after rain. The effects are local, and should be considered a possible nuisance, rather than a serious problem or hazard. For example, although radio noise in the AM broadcast band range can be generated by corona discharge, it is usually of such low intensity that it cannot be detected outside of the right-of-way of an effectively-designed 345 kV line. The same is true of audible noise television interference (Veimeister 1972; Merrill and McElhinny 1983; CRC 1981; Enertech Consultants 1985).

Audible Noise Audible noise (AN) levels for the edge of the ROW for the Proposed Action or other Alternatives during fair and foul weather are shown in *Table 3.14-3*. The calculated average fair weather noise level at the edge of the ROW is –3.4 dBA for the Proposed Action and other Action Alternatives. The noise level would be 21.6 dBA in wet conditions.

Table 3.14-3
Audible Noise (AN) Levels

Alternative	Location	Fair Weather L50 AN (dBA)	Wet Weather L50 AN (dBA)
The Proposed Action	Center of ROW	2.3	27.3
	Edge of ROW	-3.4	21.6

In most instances, the audible noise from the Proposed Project would be masked by naturally occurring sounds at locations beyond the edge of the right-of-way, such as falling raindrops during a rainstorm. The attenuation associated with distance from the line and with passing through a building wall would reduce the maximum levels below the level that interference occurs with sleep, conversation, or television viewing.

Radio and Television Interference Overhead transmission lines do not, as a general rule, interfere with normal radio or television reception. There are two potential sources of interference: corona and gap discharges. As described above, corona discharges can sometimes generate unwanted electrical activity, including electromagnetic radiation, and may affect AM radios, while gap discharges can affect television and radio reception. Corona activity is lessened through proper design of the line and is almost never a source of interference.

Due to the large number of operating radios and various frequencies, concern over interference from transmission lines must be considered. The characteristic radio frequency emissions from transmission line corona activity occur in the frequency range from about 100 kHz (kilohertz) to about 2 MHz (megahertz). Above 2 MHz, radio interference from transmission lines is usually traceable to broken or loose hardware as explained below (gap discharges). Therefore, radios (such as for operation of navigational aids; in-

strument landing systems; satellite positioning systems; police, fire, military, commercial, amateur, and citizen band radios; cordless and cellular telephones; and other radio communication systems) which operate above 2MHz should not experience interference from normal transmission line operations.

In areas of weak television signals, sometimes a ghosting or displaced image may be visible on a TV screen. This is caused by signal reflections from nearby objects such as buildings, hills, or power line structures. These "ghosts" can generally be removed by repositioning the receiving antenna.

Gap discharges are a very different problem. They are caused by electrical discharges between broken or poorly fitting hardware, such as insulators, clamps, or brackets. Hardware is designed and installed to be problem-free, but wind motion, corrosion, gunshot damage, and other factors can sometimes create a gap discharge condition. When this condition develops, intermittent gaps at connection points between hardware items allow small arcs (electrical discharges) to occur. This phenomenon is not limited to transmission lines, and can often be found on distribution lines. The discharges act as small "transmitters" at frequencies that may be received on some radio and TV receivers. Gap discharge sources can be located and repaired by electric utility engineers. The severity of any interference depends upon the strength and quality of the transmitted signal, the quality of the radio or TV set and antenna system, and the distance between the receiver and interference source. It has been shown that radio and TV sets are usually influenced more by interference sources in the home itself, because of their proximity, than by transmission lines. The large majority of interference complaints are found to be attributable to poor signal, poor antenna, heating pads, door bells, sewing machines, freezers, ignition systems, aquarium thermostats, appliances, fluorescent lights, etc. (Veimeister 1972).

An acceptable level of maximum fair weather radio interference at the edge of the ROW is 40 to 45 V/M (decibels above 1 microvolt parameter). Average levels during foul weather are, as a general rule, 15 to 22 dB higher than average fair weather levels. The predicted rain and fair weather radio interference levels are within acceptable guidelines. The expected television interference computed at 75 megahertz line during rain is also within acceptable guidelines. If radio interference generated by the proposed transmission line proves annoying in a given situation, mitigating techniques exist and would be applied on a case-by-case basis.

3.14.2.3 IMPACTS OF THE GENERATION ALTERNATIVES

Each of the distributed generation scenarios would require modifications to Tri-State's existing transmission system, including rebuilding various sections of the existing 44/69kV line to a state-of-the-art 69kV system. Other possible health and safety risks for the distributed generation alternatives are summarized below:

- Ice Fog
- Gas Turbine Engine Fire
- Electric Generator Fire
- Electrical Fault
- Fuel Tank Leak
- Lubrication Fluid Spill
- Catastrophic Structural Failure of High Speed Rotating Equipment

All of these risks, with the exception of ice fog, can be mitigated with proper maintenance, sensors, professional construction, operating practices and fire suppression equipment.

The products of combustion from the gas turbine contain large amounts of water vapor. In cold winter periods when temperatures drop below freezing, it is possible that the gas turbine exhaust would contribute to ice fog, which is extremely hazardous to automobile traffic. Based upon the location of the feasible generator sites, ice fog could be a traffic hazard to SR 145 as well as the South Fork Road. Because of the possibility that the generator would be located near the Telluride Airport, there is some possibility that ice fog could also interfere with air traffic.

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3.15 SHORT-TERM USES VERSUS LONG-TERM PRODUCTIVITY

During the life of the proposed 115 kV transmission Project, the construction phase would represent the period of greatest impact to the physical environment. Physical impacts from transmission pole installation, staging areas, access road upgrades, substation and distribution system modifications are estimated to range from approximately 285 acres (Nucla-Norwood Northern Alternative with the Norwood-Sunshine Alternative) to 455 acres (Nucla-Norwood Southern Alternative with the Norwood-Telluride Alternative).

Within five years of construction, most disturbed areas would revert to preconstruction conditions. Permanent land dedicated to the facilities would range from 2.7 acres to 10 acres. Access roads, if constructed and not reclaimed, would also remain for the duration of the Project's life (50+ years).

Potential adverse effects to air quality, transportation and noise would all be short-term, mainly localized and result during the construction phase only. These short-term effects would largely consist of increases in PM_{10} and NO_x emissions.

Impacts to soils and water quality would be short-term. Accelerated soil erosion may occur in areas susceptible to severe soil erosion, however, with implementation of potential mitigation measures for using helicopter construction in susceptible areas, effects should be short-term in duration. Similarly, water quality impacts, primarily resulting from increased sedimentation in streams, drainages and water bodies, would be expected to be short-term.

Potential impacts to biological resources would be both long-term and short-term. Long term direct effects would include the permanent loss of habitat at pole sites, substation sites and along access roads. Long-term indirect impacts to boreal toads and other sensitive species may occur where improved access increases the potential for mortalities during breading seasons, or where increased access may result in greater human activity and related habitat disturbances. Long-term indirect impacts may also occur in areas where the 115 kV poles provide perch sites for raptors that may prey on sensitive species, such as the Gunnison sage grouse. Short-term impacts to wildlife habitats would primarily be related to construction activities that could disturb sensitive species during critical winter and/or breeding periods. These impacts are considered avoidable with mitigation.

Impacts to cultural resources would primarily be long-term, potentially resulting from the permanent loss of non-renewable sites and resources. Similarly, direct physical impacts to Native American sites and paleontological resources are considered long-term and permanent. These resources are also non-renewable. It is anticipated that impacts to cultural resources are mitigable by conducting intensive 100 percent surveys, and data recovery, prior to construction.

Land use impacts would be both long-term and short-term in nature. Long-term effects would entail any permanent loss or impairment of an existing use or activity (*e.g.*. agricultural lands and operations). Long-term effects may also entail the loss of future activities, uses, or land use options due to easement restrictions. These types of effects could result from the presence of lines through subdivisions, recreational areas, or lands planned for future development. Long-term impacts could also result from the removal or relocation of existing structures within the right-of-way.

Visual impacts from the Project would be long-term, lasting the life of the Project. The presence of poles, conductors, and substations near visually sensitive recreation areas, public open space, residential areas and scenic highways could result in long-term reductions in the quality of the visual environment and the use and enjoyment of sensitive areas.

The long-term productivity effect of the Project includes providing the project area, and the Tri-State service area in southwestern Colorado, a reliable source of backup power. The proposed Project would ensure a backup source of power for residential, public communications, medical and other critical societal functions. The Project would, thus, contribute directly to the long-term stability and economic growth of the region.

3.16 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

Resources committed to the Project would be both material and nonmaterial. Irreversible commitment of resources includes those resources, once committed to the proposed project that would continue throughout the life of the project. Irretrievable commitment of resources includes those resources that would be used, consumed, destroyed, or degraded during construction, operation, maintenance and abandonment of the project that could not be retrieved or replaced for the life of the project. These are summarized in *Table 3.16-1*.

Table 3.16-1
Commitment of Resources

Resource	Commitment	Irreversible	Irretrievable
Air	Degradation of air quality	No	Construction Phase
Soils, Geology, Minerals, and Paleontology	Soil loss and erosion during construction, mineral resources, life of project	Yes - soils, paleontological resources No - mineral resources	Project life and beyond
Water Quality	Degradation of water quality during project construction	Yes	Construction phase only
Biological Resources	Disturbance to, and loss of, vegetation and wildlife species habitat during construction and operation.	Yes	Project life and beyond
Cultural Resources and Native American Resources/Sites	Disturbance or removal of prehistoric sites, historic sites, or sites important to Native American cultures; interference with visual settings	Yes	Project life and beyond
Land Use	Residential, recreation, agriculture and open space areas	Yes	Project life
Visual	Degradation of natural scenic quality; viewshed impacts to residential, recreation, and scenic highway areas	Yes	Project life
Socioeconomics	Increased regional and local revenues during construction and operation. Increased stability in region's power supply	Yes	Project life
Construction Materials and Fuels	Use of: Aggregate, Water, Aluminum, Concrete, Fossil Fuels	Yes	Project life and beyond

3.17 SIGNIFICANT AND UNAVOIDABLE ADVERSE IMPACTS

Significant, unavoidable adverse impacts are defined as those project impacts that could not be reduced to less than significant levels through mitigation measures or utilization of another alternative. Significant unavoidable adverse impacts would result on regionally important visual resources and land uses identified by San Miguel County as Priority Class 2 and 3 areas for locating powerlines. Significant, unavoidable adverse visual effects would result on either some private residences and recreation areas or on the San Juan Scenic Byway, Telluride Ski Area, and Last Dollar Road public recreation areas.

Regardless of the alternative selected, the project would impact lands considered by San Miguel County as undesirable for powerline siting. Priority Class 2 lands that would be impacted, to some degree, include irrigated agriculture, meadows and pasture land. Priority Class 3 lands affected, regardless of the alternative selected, include critical wildlife areas, lands potentially containing historical, natural, or archaeological resources, natural streams and geologic hazard areas.

It should also be noted that the potential for significant impacts to biological resources, and the effectiveness of available mitigation measures, cannot be determined until detailed surveys are conducted for the proposed project right-of-way and substation sites, and the Endangered Species Act, Section 7 consultation process with USFWS is completed.

Chapter 4

List of Preparers

4 LIST OF PREPARERS

The following USFS and BLM personnel served on the interdisciplinary team or provided input for their area of expertise. Responsibilities generally included the supervision of the surveys and inventories performed by the consultants, review of draft and final reports for technical accuracy and conformance to the scope of work, and review of the preliminary drafts of the EIS.

FOREST SERVICE PERSONNEL

Project Management

Steve Wells

Education:	B.S. Forest Management
Project Responsibility:	Project Manager from Norwood District Office/Review and acceptance of environmental resource studies
Experience:	Twenty-four years' experience with the U.S. Forest Service in timber, fire, recreation and lands positions on National Forests in Colorado, Alaska and South Dakota. Three years' experience as a Procurement Forester with the Forest Products Industry in East Texas.

Jeff Burch

Education:	B.S. Forestry and M.S. Forestry
Project Responsibility:	NEPA compliance from Supervisor's Office /environmental processes oversight
Experience:	Twenty years (four locations) as an U.S. Forest Service Planner and NEPA Coordinator, two years as Forester for International Paper Company, and one year as forester/planner for the Tlingit and Haida Indian Tribes of Alaska.

Specialists

Tamara Blett

Education:	B.S. Biological Sciences, M.S. Forest Ecology
Project Responsibility:	Air Quality
Experience:	Twelve years assessing air quality impacts on National Forests in Colorado, Wyoming, South Dakota, Kansas and Nebraska. Three years studying air pollution effects on forest ecosystems for the research branch of the Forest Service in California.

John Almy

Education:	B.S. Forest Hydrology
Project Responsibility:	Limited review of watershed and hydrology issues.
Experience:	Twenty-two years of Forest Service experience at locations in Utah, Montana, Oregon and Colorado. Twelve years' experience as a Forest Hydrologist.

Terry Hughes

Education:	B.S. Forestry
Project Responsibility:	Limited review of soils and watershed-related areas.
Experience:	Four years as field soil scientist with NRCS in various locations in Colorado, twenty-four years of experience as a forest soil scientist on the San Juan and Grand Mesa, Uncompahgre and Gunnison National Forests.

John Olen

Education: B.S. Environmental Design
Project Responsibility: Visual Resources, Scenery Management
Experience: Thirty-two years of experience in Landscape Architecture with the U.S. Forest Service on the Angeles, Tahoe, and Modoc National Forests in California; the Toiyabe National Forest in Nevada; the Challis and Salmon National Forests in Idaho; and the Grand Mesa, Uncompahgre and Gunnison National Forests in Colorado.

Bill Dunkelberger

Education: B.A. Recreation and Park Administration
Project Responsibility: Land Use and Recreation
Experience: Twenty years' experience with the ski industry and U.S. Forest Service in recreation management.

Craig Grother

Education: B.S. Wildlife Biology
Project Responsibility: Biological Resources
Experience: Twenty-three years' experience with the U.S. Forest Service on the Salmon, Humboldt, and GMUG National Forests.

Kelly Liston

Education: B.S. Range Management
Project Responsibility: Rangeland Management, Noxious Weeds
Experience: Nineteen years' experience in rangeland management with the U.S. Forest Service on the Okanogan and Colville National Forest in Washington, the Beaverhead National Forest in Montana, and the Grand Mesa, Uncompahgre, and Gunnison National Forest in Colorado.

Robert McKeever

Education: B.A. Anthropology
Project Responsibility: Cultural Resources, Geology and Paleontology
Experience: Two years as a South Zone Forest Archaeologist; four years as forestry technician; several seasons as seasonal archeologist.

BUREAU OF LAND MANAGEMENT PERSONNEL

Project Management

Teresa Pfifer

Education: Bureau of Land Management special training programs focusing on Land Use and Real Estate.
Project Responsibility: BLM Project Manager, Realty Specialist, Land Use and Socioeconomics
Experience: Ten years' experience in the Lands and Realty program.

Specialists

Amanda Clements

Education: M.S. Range Ecology and B.S. Biology
Project Responsibility: Biological Resources
Experience: Six years working with the BLM as an ecologist.

James Ferguson

Education: B.S. Wildlife Management
Project Responsibility: Biological Resources, wildlife and endangered species
Experience: Twenty-three years of experience as a biologist, resource planner, and staff supervisor for the BLM in Utah and Colorado.

Rich Fike

Education: B.A. Anthropology, History and Geography, and Graduate Studies in Anthropology.

Project Responsibility: Cultural Resources

Experience: Sixteen years as Utah State Archeologist and three years State Archeologist in Colorado.

Lynn Lewis

Education: B.S. Geology

Project Responsibility: Geology, Paleontology, and Mineral Resources

Experience: Twenty years' experience in minerals with the BLM.

John Davis

Education: M.S. Hazardous Materials Management

Project Responsibility: Human Health and Safety, Hazardous Materials Section Review

Experience: Eight years of experience in managing BLM Hazardous Materials program in southwest Colorado and twenty years' experience in resource management.

Dennis Murphy

Education: B.S. Forestry/Watershed and Graduate Studies in Hydrology

Project Responsibility: Climate, Air Quality, Soils and Water Resources

Experience: Twenty-one years of experience with the Bureau of Land Management in hydrology and soils work.

RURAL UTILITIES SERVICE

Project Management

Dennis Rankin

Education: M.S. Biology and B.A. Biology

Project Responsibility: RUS Project Manager

Experience: Twenty-five years of experience in environmental management and review and NEPA compliance of electric generation, transmission and distribution projects.

Specialists

Lawrence R. Wolfe

Education: M.S. Resource Management and B.S. Water Resource Management

Project Responsibility: EIS Review

Experience: Twenty-five years of experience in environmental review and management of electric generation, transmission and distribution projects.

Sam Gourley

Education: B.S. Electric Engineering

Project Responsibility: Engineering, Purpose and Need Review

Experience: Twenty-five years of experience in engineering review of electric transmission and distribution projects.

Howard Barnes

Education: B.S. Electric Engineering

Project Responsibility: Engineering Review, General Field Representative for Colorado, Kansas and Nebraska

Experience: Twenty-seven years' experience in engineering, project review, operations and maintenance, and management oversight of rural electric utilities throughout the United States.

CONSULTANTS

Alpine Archaeological Consultants, Inc.

Susan M. Chandler

Education:	M.A. Anthropology and B.A. Southwest Studies
Project Responsibility:	Cultural Resources Principal Investigator (EIS Section 3.7)
Experience:	Twenty years of archaeological experience and project management for projects in Arizona, Colorado, New Mexico, Utah, Wyoming and El Salvador.

Kimberly L. Redman

Education:	M.A. Anthropology/Archaeology and B.A. Anthropology
Project Responsibility:	Cultural Resources Task Leader (EIS Section 3.7)
Experience:	Ten years of experience in archaeological studies for projects located in Colorado, Utah, Kentucky and Indiana.

Jack E. Pfertsh

Education:	B.A. Anthropology
Project Responsibility:	Field Director in charge of the sample-oriented cultural resource inventory.
Experience:	Nine years of experience on archaeological excavation and cultural resource survey projects in Colorado, New Mexico and Utah. Prior to his employment at Alpine, he served as an archaeologist for the Forest Service and the National Park Service.

Alternative Energy Systems Consulting, Inc.

Ron Ishii

Education:	B.S. Mechanical Engineering
Project Responsibility:	Project Manager for Distributed Generation Studies
Experience:	Vice President, AESC. Eighteen years of experience in energy technology development, evaluation, testing and management. Member of American Society of Mechanical Engineers, Association of Energy Engineers (AEE), and the Instrument Society of America. Registered Professional Engineer in the State of California, Certificate No. 22958, and an AEE Certified Cogeneration Professional.

Shirley Rivera

Education:	B.S. Chemical Engineering
Project Responsibility:	Senior Associate with AESC, responsible for environmental issues and air emissions analysis.
Experience:	Thirteen years of experience in air quality permitting compliance and planning. Served with U.S. EPA Region 9 as a permit engineer.

Greg Stevens

Education:	B.S. Environmental Resources Engineering
Project Responsibility:	Associate Engineer responsible for technical assistance in research and analysis of permitting and process equipment.
Experience:	Three years of experience. Associate Engineer with AESC.

Dean Perry

Education: B.S. Electrical Engineering and Mathematics

Project Responsibility: Senior Associate/Consultant with AESC, responsible for technical review of transmission system issues and senior Q.A. review of Tri-State Planning Studies.

Experience: Thirty-six years of experience with Bonneville Power Administration, including 10 years as Director of System Planning. Has served as Chairman of the WSCC Planning Coordination Committee and has represented WSCC on the NERC Engineering Committee.

Asolan Associates

Mark J. Asolan

Education: B.S. Meteorology

Project Responsibility: Climate and Air Quality Task Leader (EIS Section 3.2)

Experience: Twenty years as a Meteorologist and Atmospheric Scientist.

BIO-Logic Research, Inc.

Stephen A. Boyle

Education: M.S. Wildlife Biology and B.A. Biological Sciences

Project Responsibility: Wildlife Biologist (EIS Section 3.6)

Experience: Twenty years' experience as a Wildlife Biologist performing biological assessments, T/E species surveys, habitat relationships modeling, research, and natural resources planning.

Kim Potter

Education: M.S. Biology

Project Responsibility: Wildlife Biologist, field surveys for biological resources and evaluating habitat suitability (EIS Section 3.6)

Experience: Ten years' of experience as a wildlife biologist in western United States.

Buckhorn Geotech, Inc.

Thomas E. Griepentrog

Education: M.S. Geological Engineering, B.S. Civil Engineering, and General Engineering Degree

Project Responsibility: Geology, Paleontology and Mineral Resources Task Leader (EIS Section 3.3)

Experience: Over thirty-eight years as an Engineer providing geotechnical services and conducting geologic investigations structural analyses, water augmentation plans, and design of foundations and infrastructure.

William M. Ungerer

Education: B.S. Civil Engineering

Project Responsibility: Soils Task Leader (EIS Section 3.4)

Experience: Thirty years' experience as an Engineer specializing in geological and materials testing.

Rebecca Hooton Nichols

Education: B.S. Business Administration and M.S. Watershed Science

Project Responsibility: Water Resources Task Leader (EIS Section 3.5)

Experience: Seventeen years' experience as a Water Resource Specialist and acts as a liaison with state agencies for permit compliance.

Judith D. Kittson

Education:	New Zealand Certificate in Civil Engineering and State of Colorado Professional Engineer
Project Responsibility:	Natural Resources Coordinator (EIS Sections 3.3, 3.4 and 3.5)
Experience:	Seventeen years as an Engineer responsible for flood plain and drainage analysis, planning, environmental studies and regulatory compliance for engineering projects, and civil design of grading and utility projects.

EDM

Richard Harness

Education:	M.S. Wildlife Biology and B.S. Fisheries and Wildlife
Project Responsibility:	Biological Resources - Raptor Specialist providing recommendations regarding avian collision and electrocution issues.
Experience:	Eighteen years' experience as project manager evaluating powerline routing and construction impacts on natural resources.

Geo/Graphics, Inc.

Gerald C. Hughes

Education:	B.A. Geography
Project Responsibility:	GIS GIS Project Management and Administration
Experience:	President, GEO/Graphics. Twenty years' experience in Cartography and GIS consulting.

John H. Lowry

Education:	B.A. International Relations and M.S. Geography
Project Responsibility:	GIS analyst/database and map production
Experience:	Eight years' experience working with GIS and related technologies. Five years' experience working with GIS for environmental impact assessment.

Andre Coleman

Education:	B.S. Geography and Earth Resources
Project Responsibility:	Ortho-photo rectification and land use interpretation
Experience:	Five years' experience in GIS technology and photogrammetry.

Kathol and Company

Jennifer Kathol

Education:	B.S. Natural Resource Economics
Project Responsibility:	Noise, Recreation, Socioeconomics and Transportation Task Leader (EIS Sections 3.9, 3.11, 3.12 and 3.13)
Experience:	Twenty years' experience as an economic specialist.

KEA Environmental, Inc.

Jack White

Education:	M.A. Geography and B.A. Geography
Project Responsibility:	KEA Project Director for Biological Resources (EIS Section 3.6)
Experience:	Twenty-seven years' experience as project manager and NEPA documentation and permitting specialist.

Paula Jacks

Education:	M.S. Biology and B.A. Biology
Project Responsibility:	Biological Resources Task Leader (EIS Section 3.6)
Experience:	Twenty years' experience as a Senior Biologist and Permitting Specialist.

John Messina

Education:	M.S. Ecology, B.S. Conservation and Resource Studies, and PhD Candidate, Philosophy, Ecology
Project Responsibility:	Project Botanist (EIS Section 3.6)
Experience:	Nine years' experience as a Biologist.

Richard Dwerlkotte

Education:	B.S. Environmental Biology
Project Responsibility:	Project Wildlife Biologist (EIS Section 3.6)
Experience:	Sixteen years' experience as a Botanist.

McVehil-Monnett Associates, Inc.

Tom Hormel

Education:	B.S. Meteorology
Project Responsibility:	Air Quality Task Leader for Distributed Generation Alternatives, Visibility Analysis
Experience:	Twenty-six years' experience in air quality analyses. Senior Project Manager with McVehil-Monnett Associates, Inc. Responsible for numerous air permitting, modeling and air monitoring projects.

Power Engineers

Jerry Johnson

Education:	BSEE (Power Option), South Dakota School of Mines & Technology
Project Responsibility:	Underground Cable System Engineer
Experience:	Mr. Johnson has over seven years of high voltage design experience and is responsible for a full range of transmission and distribution design and analysis. He has experience in HV and EHV underground transmission lines including high-pressure fluid filled pipe (HPFF), high-pressure gas filled pipe (HPGF), self-contained fluid-filled pipe (SCFF) and extruded dielectric cables ranging from 69 kV to 345 kV. His installation experience includes horizontal and directional drilling, tunnel installations and jack and bore installations. He is a registered engineer in Idaho, Maryland, Massachusetts, Puerto Rico, and affiliated with the Institute of Electrical and Electronics Engineers (IEEE) IEEE, Insulated Conductors Committee (ICC).

Radian International, LLC

Robert L. Pearson

Education:	Ph D. Remote Sensing of Natural Resources, M.S. Remote Sensing of Natural Resources, and Professional Degree, Geophysical Engineer
Project Responsibility:	Human Health and Safety Task Leader (EIS Section 3.14)
Experience:	Twenty-five years of experience in the field of electric magnetic fields (EMF) health effects, including the last eight years of original research in the analysis of the association of childhood leukemia with a child's living near electric powerlines.

Schmidt Design Group, Inc.

Gary Ruyle

Education:	Master of Landscape Architecture and B.S. Park Administration
Project Responsibility:	Landscape Architect, Visual Analysis (EIS Section 3.10)
Experience:	Twenty years' experience as a Landscape Architect specializing in the use of the BLM's Visual Resource Management System (VRM) and the U.S. Forest Service's Visual Quality Objectives Program (VQO).

S. Edwards, Inc. (SEI)

Sally Edwards

Education:	B.S. Forest Management, M.S. International Resource Management, and Certified Silvaculturist.
Project Responsibility:	Responsible for public scoping.
Experience:	Employed fifteen years with the Forest Service in Regions 2, 3, 6, 8 and 10, and District Ranger in Regions 2 and 10. Independent Contractor and President of S. Edwards, Inc. since 1991.

View Point West

Christine Keller

Education:	M.A. Geography, Conservation of Environmental Quality, and B.A. Sociology
Project Responsibility:	EIS Project Manager responsible for coordination of consultant resource specialists, EIS document preparation, Land Use and Visual Resource Task Leader (EIS Sections 2.1, 2.2, 2.3, 3.1, 3.8 and 3.10)
Experience:	Partner, View Point West. Twenty-six years' experience in managing environmental compliance programs for energy projects within the western United States.

Tony J. Kovacic

Education:	A.S. Computer Technology
Project Responsibility:	Visual Simulation Specialist/Photographer
Experience:	Partner, View Point West. Nineteen years as a computer specialist in AutoCAD, Land CAD, Hi-Res QFX, and Truevision Imaging Software.

Lori Weinberg

Education:	B.A. Geography, Environmental Resource Conservation, Graduate studies-Masters in Business Administration, and Hazardous Materials Management Certification Program
Project Responsibility:	Planned Land Use
Experience:	Thirteen years as a land use planner and assistant project manager.

Linda Munson-Haley

Education:	Studies in graphic arts and computer programming
Project Responsibility:	Editor, document design and production, word processing
Experience:	Twenty years' experience in desktop publishing, typesetting, layout and design, supervised document production for technical reports and media publications.

PROJECT PROPONENT

Tri-State Generation and Transmission Association, Inc.

Representatives

Bobby Bond	Land and Land Rights, Management
Steve Mundorff	Civil Engineering, Management
Karl Myers	Environmental Compliance
Frank McElvain	Electric System Planning
Marianne Ramos	Electric System Planning
Dill Ramsey	Electric System Planning, Management

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Chapter 5

References

5 REFERENCES AND CONSULTATIONS

CHAPTERS 1 AND 2

Alternative Energy Systems Consulting, Inc. (AESC)

2000 "Telluride Distributed Generator Alternative Analysis, Evaluating Technical and Cost Information for the Nucla-Telluride Project Environmental Impact Statement," Final Report, December 13, 2000.

Competitive Utility Strategies, LLC. (CUS)

1999 "Electric Power Supply Options for Telluride, Colorado Region", prepared for the Telluride County Commissioners, San Miguel Energy Resource Group (SMERG), December 9, 1999.

2000 Addendum to December 9, 1999 Competitive Utility Strategies Report, April 5, 2000.

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1998 Sunshine Substation Bay Addition Grading Plan, Sheet No. SU-C110, December 21, 1998.

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1999 Radian Corporation. Personal communication with Sally Edwards of S. Edwards, Inc. July.

Power Engineers, Inc.

"Nucla-Telluride 115 kV Transmission Line Project; Cable System Evaluation Report," February 1999.

"Nucla-Telluride Transmission Line Project Underground Cable Systems", September 2001.

San Miguel Power Association, Inc.

1998 Draft Power Requirements Study, Colorado 26 San Miguel.

Tri-State Generation and Transmission Association, Inc. (Tri-State)

1998a Map showing proposed alignment near Wilson Mesa. Facsimile transmittal to Christine Keller, View Point West from Stephen Mundorff, Civil Engineering Manager, dated November 30, 1998.

1998b "Summary of Design Characteristics." Facsimile transmittal to Christine Keller, View Point West. December 1, 1998.

1998c Policy Statement No. 054 regarding Underground High Voltage Transmission Facilities. December 2, 1998.

1998d Correspondence from Stephen Mundorff to Christine Keller, View Point West, December 8, 1999. Attached drawings dated November 23, 1998 of proposed transmission and distribution structures, include:

1) Th-10VOX H-Frame Tangent,
2) TH-14 Large Angle Structure,
3) Th-15 Large Angle Deadend,
4) YP-115 Single Pole Tangent,
5) TS-4A Single Ple Angle,
6) TS-5A Single Pole Deadend,
7) TP-115 W/VC9-3 Single Pole Tangent with Underbuild,
8) TS-4A W/VC8-1 Single Pole Angle with Underbuild,
9) TS-5A W/VC7-1M Single Pole Deadend with Underbuild,
10) TP-1-DC Double Circuit Structure,
11) VC1B-2M Distribution Tangent,
12) VC3-1M Distribution Angle, and
13) VC4-1LM Distribution Deadend

1998e Policy Statement No. 050 for purchase of capacity and energy from small generation sources using renewable energy resources. September 2, 1998.

1999a Response to View Point West data and information request. By letter from Stephen Mundorff, dated January 5, 1999. Attachments included: 1) Project design information and preliminary list of data requirements, 2) 115 kV Line Design and ROW characteristics, 3) personnel and equipment required for project construction, 4) proposed substation addition design characteristics, and 5) conceptual construction schedules.

1999b Responses by Stephen Mundorff to View Point West information requests of January 11, 1999, and personal communications February 24, March 20, May 18 and May 26, 1999.

1999c Response from Stephen Mundorff to View Point West's "Information/Questions for Tri-State," January 19, 1999.

1999d Response to information request from View Point West. By letter from Stephen Mundorff, January 15, 1999. Attachments included: 1) drawings of tree trimming clearance for H-frame and single-pole structures (See CUSCO), 2) information on cut/fill for the proposed Norwood Substation Expansion, 3) Copy of drawing for Sunshine Bay Additions Grading Plan (See ESC), 4) Copy of Norwood Substation December 1998 Topo, January 8, 1999, 5) Copy of Norwood Substation Conceptual Grading Plan, dated January 13, 1999, and 6) Copy of Snyder Substation Conceptual Grading Plan, January 6, 1999.

1999e Response to information request from View Point West. By letter from Stephen Mundorff, February 15, 1999. Information attached included: 1) Sunshine-Telluride 69/115kV Structures Up Lawson Hill to Telluride Substation," dated February 11, 1999, and 2) "Advisory Circular" AC 70/7460-1H, "Obstruction Marking and Lighting," prepared by the U.S. Department of Transportation Federal Aviation Administration, Effective: August 1, 1991.

1999f Tri-State Generation & Transmission Association, Nucla-Telluride 115kV Transmission Line Project Cable System Evaluation Report

1999g Response to information request from View Point West. Correspondence from Stephen Mundorff dated March 1, 1999.

1999h Correspondence from Stephen Mundorff to View Point West, dated March 3, 1999. Attachment referenced "Telluride Sub Drawing, Rev. 1" (see ESC)

1999i Letter from Stephen Mundorff to View Point West regarding "Keystone KOP K, March 11, 1999.

1999j Nucla-Telluride 115 kV Transmission Line Project Technical Justification, prepared by Frank R. McElvain, April 1999.

1999k "Summary of Cost Estimates" provided by Stephen Mundorff, April 8, 1999.

1999l Letter to View Point West from Stephen Mundorff, April 15, 1999. Included photograph of "Coal Bank Pass single-phase tap."

1999m Response to information request from View Point West. By Rich Purdy, Tri-State, November 1999.

1999n Response to information request from View Point West. By Stephen Mundorff via fax, December 15, 1999.

2000a Letter from Karl Myers, Senior Environmental Planner, transmitting signed memorandum from Steve Faucett to M. Monika Eldridge, Competitive Utility Strategies, dated March 9, 2000.

2000b "Local Generation Alternative Analysis, Nucla-Telluride Transmission Project," May 2000.

2000c Letter from Stephen A. Fausett, Senior Vice President Responding to Forest Service's letter (Garry Edson, Norwood District Ranger) of January 20, 2000, June 20, 2000.

2000d "Nucla-Telluride 115kV Project, Planning Study," prepared by Bill Anderson, July 26, 2000.

2000e Letter from Stephen Fausett, Senior Vice President, and Gary N. Norton, San Miguel Power Association General Manager to Forest Service (Garry Edson, Norwood District Ranger, July 26, 2000.

2000f Letter from Bill Anderson, Senior Electrical Engineer to Ronald Ishii, AESC, August 16, 2000.

2001a FAX and e-mail transmittals from K. Myers; Tri-State Comments on Purpose and Need (Chapter 1.0), Project Description (Chapter 2.0), and Appendix A, February 5, 2001.

2001b Nucla-Telluride Transmisson Line Project, San Miguel County Special Use Permit Application, May 2001.

2001c Nucla-Telluride Trasmission Line Project, Montrose County Special Use Permit Application, May 2001.

CHAPTER 3

CLIMATE AND AIR QUALITY

Chick, N.D. (1999a)

Air Pollution Control Specialist, Colorado Department of Health and Environment, Air Pollution Control Division, Denver, Colorado. Personal communication with Mark Asoian, Asoian Associates LLC. March 2, 1999. Transmitted data disk to Mark Asoian of Naturita Uranium Mill Tailings Project Meteorological Data for 1996. March 10, 1999.

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Air Pollution Control Specialist, Colorado Department of Health and Environment, Air Pollution Control Division, Denver, Colorado. Letter to Mark Asoian, Asoian Associates LLC., March 2, 1999.

Colorado Air Quality Control Commission

1996 Regulation No. 3 Air Pollution Emission Notices, Construction Permits and Fees, operating Permits, and including the Prevention of Significant Deterioration. Part A, Section B.59.

Colorado Department of Public Health and Environment (CDPHE)

1997 Colorado 1997 Air Quality Report.

Colorado Climate Center

1999 Monthly Climatic Data. This information can be found on Colorado Climate Center's Web Site at: *http://ccc.atmos.colostate.edu/cgi-bin/mlydb.pl.*

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1998 Compilation of Air Pollution Emission Factors Ap-42, Volume I: Stationary Point and Area Sources at *http://www.epa.gov/orcdizux/ap42html.*

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McVehil-Monnett Associates, Inc.

2000 Visibility Impact Analyses from Distributed Generation Alternative Emissions. Englewood, Colorado.

Silverstein, M. Air Pollution Control Specialist, Colorado Department of Health and Environment, Air Pollution Control Division, Denver, Colorado. Personal communication with Mark Asoian, Asoian Associates LLC., June 15, 1999.

GEOLOGY, PALEONTOLOGY AND MINERALS

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1976 Natural Hazards of San Miguel County, Colorado. A contribution to the United States Unesco Man and the Biosphere (MAB) Program Project 6: Study of the impact of human activities on mountain and tundra ecosystems. 50 pages.

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Chronic, J. and H.

1972 Prairie Peak and Plateau, A Guide to the Geology of Colorado, Colorado Geological Survey Bulletin 32. 126 pages.

Colorado Division of Minerals and Geology

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See Appendix C

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Chapter 6

Glossary

6 GLOSSARY

ACSR (Aluminum Cable Steel Reinforced) - a type of conductor used in high voltage transmission lines. It describes a composite conductor, made up of a combination of aluminum wires that surround the steel.

Affected Environment - a physical, biological, social, and economic environment within which human activity is proposed.

alternating current (AC) - a periodic current, the average value of which over a period is zero, and refers to a current which reverses at regularly recurring interval of time and which has alternately positive and negative values. Each period which averages to a value of zero is called a cycle, and the number of cycles during a given time interval is called frequency. The standard frequency in the United States is 60 cycles per second (or hertz).

alternatives - the different means by which objectives or goals can be attained. One of several policies, plans, or projects proposed for decisionmaking. Basis of comparative decision making through the NEPA process.

ampere (A) - the unit of measurement of electric current. It is proportional to the quantity of electrons flowing through a conductor past a given point in one second.

artifact - any object made by human work; especially, a simple or primitive tool, weapon, vessel, etc.

availability - a measure of time a generating unit, transmission line, or other facility is capable of providing service, whether or not it actually is in service. Typically, this measure is expressed as a percent available for the period under consideration.

backup power - power provided by contract to a customer when that customer's normal source of power is not available.

blackout - a condition that describes a total loss of electrical service.

blackstart capability - the ability of a generating unit or station to go from a shutdown condition to an operating condition and start delivering power without assistance from the electric system.

brachiopod – a member of a phylum (*Brachiopoda*) of marine animals with hinged upper and lower shells enclosing two armlike parts with tentacles used for guiding food particles to the mouth

brome – any of a large genus (*Bromus*) of grasses of the temperate zone, having closed sheaths and spikelets with awns: a few are crop plants but many are weeds

brownout - a voltage reduction during an electrical shortage that causes conditions such as dimmed lights.

bus - an electrical conductor, or group of conductors, which serves as a common connection for two or more electric circuits.

capacity - the rated continuous load-carrying ability, expressed in megawatts (MW) or megavolt-amperes (MVA) of generation, transmission, or other electrical equipment.

CFR (Code of Federal Regulations) - a codification of the general and permanent rules published in the Federal Register by the executive departments and agencies of the Federal Government.

circuit - a conductor, such as wire, through which electric current flows. Also, the path electric current takes from a power source to the device using the power.

circuit breaker - a switching device capable of making, carrying and breaking electrical currents under normal circuit conditions; and also making, carrying (for a specified time), and breaking electrical currents under specified abnormal conditions, such as those of short circuit.

cist - a box or chest, especially one containing sacred vessels.

clearing - removal of vegetation to provide adequate conductor-to-tree clearance. Disposal of cleared vegetation is as directed by the landowner.

closed circuit - a closed circuit is one in which current has a continuous path, and can flow. A closed circuit allows power transfer.

co-generation - consumers who produce their own power and energy requirements and sell their excess electricity back to the local electric company. Co-generation is the dual use of steam - thermal and electric power -produced by an industrial process, such as a wood processing plant.

colluvium - rock fragments, sand, etc. that accumulate on steep slopes or at the foot of cliffs.

conductor - a material, usually in the form of a wire, cable, or bus bar, suitable for carrying an electric current.

construction lay-down area - typically a 200-foot by 700-foot area used to store layout, frame, and assemble poles prior to taking them to the site for installation.

consumer - customers - businesses, residents, industries and towns - that use electricity.

contingency - an event that is of possible but uncertain occurrence. As related to the high voltage electrical system, this refers to the loss of use of a facility that supports the delivery of electricity to consumers. The high voltage transmission system is generally

designed to withstand any single contingency, or the loss of use of any one facility.

cooperative - a member-owned business with membership open to those who use its services. Democratically controlled and operated on a nonprofit basis, a cooperative returns any margins or profits to members on the basis of patronage.

coprolite – fossilized excrement of animals

corridor - a linear strip of land identified for the present or future location of transportation or utility rights-of-way within its boundaries.

Council on Environmental Quality (CEQ) - an advisory council to the President established by the National Environmental Policy Act of 1969. It reviews federal programs for their effect on the environment, conducts environmental studies, and advises the president on environmental matters.

cultural resources - the remains of sites, structures, or objects used by humans in the past- historic or prehistoric. More recently referred to as heritage resources by the Forest Service.

cumulative impacts - the impact(s) or effect(s) on the environment which result(s) from the incremental impact of the action when added to other past, present, and reasonable foreseeable future actions, regardless of which agency (federal or non-federal) or person undertakes such other actions. Cumulative impacts can result from individual minor but collectively significant actions taken place over a period of time (40 CFR 1508.7 - these regulations use effects and impacts synonymously).

current - the flow of charged particles through a conductive material.

cycad - any of an order of tropical shrubs and trees resembling thick-stemmed palms, with crowns of leathery, fernlike leaves and large cones containing fleshy seeds.

cycle - the complete series of values of a periodic quantity that occurs during a period. It is one complete set of positive and negative values of an alternating current.

decibel (dB) - a unit for expressing the relative intensity of sounds on a scale from zero for the average least perceptible sound to about 130 for the average pain level.

delivery point - the location in an electrical system, usually a substation, where electricity is transferred from an electrical provider to an electrical user.

demand - the rate at which electric energy is delivered to or by a system or part of a system, generally expressed in kilowatts (kW)or megawatts (MW), at a given instant or averaged over any designated interval of time. Demand should not be confused with Load.

Demand-side Management (DSM) - a utility strategy to influence conservative and efficient use of electricity by consumers.

direct impacts - impacts that are caused by the action and occur at the same time and place.

dispatchable generation - generation available physically or contractually to respond to changes in system demand or to respond to transmission security constraints.

distribution circuit - an alternating current transmission line, that has as its primary purpose the delivery of electrical power from the high voltage transmission system network to end-use customers, or a group of end-use consumers. Characteristics of distribution circuits in the Telluride area are that power flows in only one direction, to the end-use consumer, since it is not a part of a network; and it is energized to approximately 24.9 kilovolts.

distribution system - a system of electrical devices and equipment that delivers electrical energy to electrical consumers. The distribution system generally has the capability to close alternate circuits for contingencies, but is not operated as a network.

easement - an agreement allowing a utility to use property belonging to an individual or organization to construct, operate, maintain and control facilities, such as a transmission line. The right or privilege obtained to construct, maintain and operate transmission facilities within a right-of-way.

echinoderm - any of a phylum of marine animals with a water vascular system, and usually with a hard, spiny skeleton and radial body, including the starfishes, sea urchins, etc.

electric field - an electric field is created in the vicinity of transmission lines by the electric charges on the conductors. This field decreases rapidly and non-uniformly from the conductor surface to the ground surface and to objects in the area. It is influenced and shaped by the objects in the area. The strength of an electric field at a point is defined as the force that would occur on a unit electric charge at that point. Field strength is expressed in a voltage per distance ratio, such as kilovolts/meter (kV/m).

electric motors - machines that transform electric energy into mechanical energy for moving air, materials, or fluids.

electric system losses - total electric energy losses in the electric system. The losses consist of transmission, transformation, and distribution losses between supply sources and delivery points. Electric energy is lost primarily due to heating of transmission and distribution elements.

electric utility - a corporation, person, agency, authority, or other legal entity or instrumentality that owns or operates facilities for the generation, transmission, distribution, or sale of electric energy primarily for use by the public and is defined as a

utility under the statutes and rules by which it is regulated. Types of Electric Utilities include investor-owned, cooperatively owned, and government-owned (federal agency, crown corporation, state, provincials, municipals, and public power districts).

electrical energy - the generation or use of electric power by a device over a period of time, expressed in kilowatt-hours (kWh), megawatt-hours (MWh), or gigawatt-hours (GWh).

emergency - any abnormal system condition that requires automatic or immediate manual action to prevent or limit loss of transmission facilities or generation supply that could adversely affect the reliability of the electric system.

EMF (Electric and magnetic fields) - the presence of electrical voltage and current in a wire produces these fields. These invisible lines of force exist in an area surrounding any electrical device, including powerlines, household wiring and appliances. Extensive scientific studies to date have failed to establish any link between EMF exposure and adverse health effects.

endangered species - any species of animal or plant that is in danger of extinction throughout all or a significant portion of its range. Plant or animal species identified by the Secretary of the Interior as endangered in accordance with the 1973 Endangered Species Act.

energy - electrical power usage over a specified time interval usually measured in kilowatt-hours (kWh). Energy is the integral of power, with respect to time.

energy emergency - a condition when a system or power pool does not have adequate energy resources (including water for hydro units) to provide its customers' expected energy requirement.

EIS (Environmental Impact Statement) - a report required by many state and federal regulators that outlines the likely environmental consequences of building facilities such as powerlines.

environment - the physical conditions that exist within the area that will be affected by a proposed project, including land, air, water, minerals, flora, fauna, ambient noise, and objects of historical or aesthetic significance. The area involved shall be the area in which significant effects would occur either directly or indirectly as a result of the project. The "environment" includes both natural and man-made conditions.

erosion - the wearing away of the land surface by running water, wind, ice or other agents.

event - a random or weather-related occurrence that causes an outage of an electrical facility.

expected unserved energy - the expected amount of energy curtailment per year due to demand exceeding available capacity. It is usually expressed in megawatt-hours (MWh).

fault - a point of defect in an electric circuit that prevents the current from following the intended course.

flashover - an abnormal electrical discharge, as from a high-voltage powerline to a ground.

flocculating processes - to cause soil to form lumps or masses.

forb - a broadleaved flowering plant, as distinguished from the grasses, sedges, etc.

forecast - predicted demand for electric power. A forecast may be short term (e.g., 15 minutes) for system operation purposes, long-term (e.g., five to 20 years) for generation planning purposes, or for any range in between. A forecast may include peak demand, energy, reactive power, or demand profile. A forecast may be made for total system demand, transmission loading, substation/feeder loading, individual customer demand, or appliance demand.

forecast uncertainty - probable deviations from the expected values of factors considered in a forecast.

gastrolith - a stony concretion formed in the stomach.

gauss - a unit of measurement of magnetic field intensity. The gauss indicates the number of lines of magnetic force (attraction) per unit area. For transmission lines, gauss is a large unit, so often the milligauss is used.

generation (electricity) - the process of producing electrical energy from other forms of energy; also, the amount of electric energy produced, usually expressed in kilowatt-hours (kWh) or megawatt-hours (MWh).

generator - a machine that transforms mechanical energy into electrical energy.

grama - any of a genus (*Bouteloua*) of native range grasses of the western U.S.

grid - a high-voltage transmission network. This refers to a system of interconnected high-voltage transmission lines and power-generating facilities that allows large quantities of electrical power to be shared on a regional basis, optimizing the use of resources. The nature of an electrical grid, or network, is to combine facilities so that the overall system reliability is higher than any of the individual components.

ground - a conducting connection, whether intentional or accidental, between an electrical circuit or equipment and the earth, or to some conducting body that serves in place of the earth. The earth has zero voltage potential.

habitat capability - the estimated ability of an area, given existing or predicted habitat conditions, to support a wildlife or plant population. It is measured in terms of potential population numbers.

heat rate - the amount of fuel consumed by a generator to produce one unit of electric energy. [Btu/kWh]

Hertz (Hz) - a unit of frequency equal to one cycle per second.

H-frame structures - typically support three conductors and two overhead ground wires. Spans between structures would vary between 400 and 1,000 feet, with pole heights ranging from 61 to 88 feet above ground. H-frame pole structures are utilized where the line deflection angle is less than 5 degrees.

indirect impacts - impacts which are caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable.

inside phase - a high voltage transmission line has three phases, and a phase implies one of the three energized conductors of that three-phase system. The inside phase is the center conductor of that three-phase system.

insulator - a device intended to give flexible or rigid support to electrical conductors or equipment, and to insulate these conductors or equipment from ground or from other conductors or equipment. An insulator comprises one or more insulating parts to which connecting devices (metal fittings) are often permanently attached.

Interdisciplinary Team (IDT) - as proposed by Forest Service and BLM regulations, the interdisciplinary team will be comprised of personnel who collectively represent two or more areas of specialized technical knowledge about natural resources management applicable to the area being planned. The team will consider problems collectively, rather than as separate concerns along disciplinary lines. This interaction is intended to ensure systematic integrated consideration of social, environmental, economic and other sciences.

IRP (Integrated Resource Plan) - a plan to balance resources and loads by integrating programs that independently affect supply and demand. For example, the construction of a power plant (supply related) can be delayed if a conservation program (demand related) is instituted.

issue - a point, matter, or question of public discussion or interest to be addressed or decided through the planning process.

jurisdictional wetland - a wetland area delineated and identified by specific technical criteria, field indicators, and other information for purposes of public agency jurisdiction. The public agencies that administer jurisdictional wetlands are the Fish and Wildlife Service, Army Corps of Engineers, Environmental Protection Agency, and the Soil Conservation Service.

kilovolt (kV) - equal to 1,000 volts (*see also definition for volt.*)

kilowatt (kW) - equal to 1,000 watts (*see also definitions for watt.*)

kilowatt-hour (kWh) - A unit of electric energy equal to one kilowatt acting for one hour

lanceolate - narrow and tapering like the head of a lance, as certain leaves

land status - the ownership status of lands

lek – an assembly area where birds and especially grouse carry on display and courtship behavior

line - a component part of a system extending between adjacent stations or from a station to an adjacent interconnection point. A line may consist of one or more circuits.

load - synonymous with demand, it is the amount of electric power usage at any given time and location. This is generally measured in megawatts or kilowatts.

load forecasting - predicting a system's future load

Load Management Program - a program designed to increase operation or economic efficiency by influencing demand. The planned systematic use of load controls is part of the program.

load shedding - curtailment of electrical service to pre-selected customers or areas when available power or system conditions are inadequate to meet the total system demand (or load).

long-term impacts - impacts that result in permanent changes to the environment. An example is a topographic change resulting from new road construction.

Loop Transmission System - a system in which alternate transmission lines can deliver power to an area if lines fail. Also synonymous with transmission grid and transmission network.

losses - power expended without accomplishing useful work. Such losses are usually expressed in kilowatts.

magnetic field - region of magnetic influence or attraction, similar to the effect near a magnet. The field that is formed around the conductors of a transmission line is caused by the current flowing in the conductors.

margin - the difference between net capacity resources and net internal demand. Margin is usually expressed in megawatts (MW).

marshalling yard/material - an area approximately 200 feet by 200 feet in size used as temporary reporting locations for workers, parking spaces for vehicles, locations for office trailers, and locations for equipment and material storage.

megawatt(s) (MW) - equal to 1,000,000 watts. (See also definitions for watt.)

midden – a dunghill or refuse heap

migratory - moving from place to place, daily or seasonally.

mitigation - mitigation includes: (a) avoiding impact altogether by not taking a certain action or parts of

an action; (b) minimizing impacts by limiting the degree or magnitude of an action and its implementation; (c) rectifying the impact by repairing, rehabilitating or restoring the effects to the environment; (d) reducing or eliminating the impact over time by preservation and maintenance of operations during the life of the action; and (e) compensating for the impact by replacing or providing substitute resources or environments (40 CFR Part 1508.20).

monitoring and evaluation - watching, observing or checking. In this instance, a continuing testing of specific environmental parameters and of project waste streams for purposes of comparing with permit stipulations, pollution control regulations, mitigation plan goals, etc. Periodic evaluation of management practices on a sample basis determines how well objectives have been met.

monocline – dipping in one direction: said of strata, or rock layers

montane – of, relating to, growing in, or being the biogeographic zone that is made up of relatively moist cool upland slopes below timberline and that is characterized by large evergreen trees as a dominant life form

National Environmental Policy Act (NEPA) - the National Environmental Policy Act of 1969 is a National charter for protection of the environment. It establishes policy, sets goals, and provides means for carrying out the policy. 40 CFR 1500-1508 are the regulations for implementing the Act.

NEPA Process - all measures necessary to comply with the requirements of Section 2 and Title 1 of NEPA.

open circuit - an open circuit is one in which current cannot flow, and therefore, power cannot be transferred.

outage - the state of an electrical system component when it is not available to perform its intended function due to some event. An outage may or may not cause an interruption of service to consumers, depending on system configuration.

forced outage - the removal from service availability of a generating unit, transmission line, or other facility for emergency reasons or a condition in which the equipment is unavailable due to unanticipated failure.

forced outage rate - the hours a generating unit, transmission line, or other facility is removed from service, divided by the sum of the hours it is removed from service, plus the total number of hours the facility was connected to the electricity system expressed as a percent.

maintenance outage - the removal of equipment from service availability to perform work on specific components that can be deferred beyond the end of the next weekend, but requires the equipment be removed from service before the next planned outage. Typically, a Maintenance Outage may occur anytime during the year, have a flexible start date, and may or may not have a predetermined duration.

planned outage - removing the equipment from service availability for inspection and/or general overhaul of one or more major equipment groups. This outage usually is scheduled well in advance.

outside phase - a high voltage transmission line has three phases, and a phase implies one of the three energized conductors of that three-phase system. The outside phases are the two conductors that are not the inside conductor of that three-phase system.

overhead ground wires - grounded wires placed in close proximity to an energized transmission line. Overhead ground wires are used to protect the transmission line from lightning.

palynological – relating to the study of living or fossil plant spores and pollen

peak demand/peak load - the highest electrical usage at a specified time and location

pentachlorophenol – a white powder, produced by chlorinating phenol: used as a herbicide, fungicide, wood preservative, etc.

phase - one conducting wire of a 3-wire alternating current circuit

photographic targets - a symmetrical pattern, usually a plastic sheet in the shape of an "X", that is placed on the ground throughout an area to be photographed from the air. Aerial photographs containing these targets assist the surveyor in determining locations and elevations.

Plan of Operations - a detailed description presenting the methods, timing, and contingencies to be used during the operation of the project.

power - the rate of generating, transferring, or using energy. Usually measured in kilowatts or megawatts.

apparent power - the product of the volts and amperes. It comprises both real and reactive power, usually expressed in kilovoltamperes (kVA) or megavoltamperes (MVA).

reactive power - the portion of electricity that establishes and sustains the electric and magnetic fields of alternating-current equipment. Reactive power must be supplied to most types of magnetic equipment, such as motors and transformers. It also must supply the reactive losses on transmission facilities. Reactive power is provided by generators, synchronous condensers, or electrostatic equipment such as capacitors and directly influences electric system voltage. It is usually expressed in kilovars (kvar) or megavars (Mvar).

real power - the rate of producing, transferring, or using electrical energy, usually expressed in kilowatts (kW) or megawatts (MW).

Power Flow Program - a computerized algorithm that simulates the behavior of the electric system under a given set of conditions.

pozzolans - an ingredient added to cement to extend the curing time.

project - the whole of an action, which has a potential for resulting in a physical change in the environment.

public scoping - giving the public the opportunity for free, unhampered speaking or writing concerning the intentions, activity, or influence of a project on the community, environment, personal, or anything relative.

radial line - an electrical circuit supplying energy to a substation, or point of electrical usage, that receives energy by no other means. The normal flow of power in such a circuit is in one direction only. An outage of a radial line will cause an interruption of service to consumers.

raptor - bird of prey, including eagles, hawks, falcons, and owls

reclamation - efforts made to restore resources to their pre-construction condition

reliability - the ability of a system to function without failure over a specified time or amount of use. The reliability of the electrical system is determined by the ability to avoid consumer service interruptions.

revegetation - restoring/replacing vegetation in disturbed areas to original condition.

right-of-way (ROW) - land used by a utility to build a transmission line. The landowner allows passage for the utility to conduct maintenance and repairs.

riparian - pertaining to, living or situated on, the banks of rivers and streams

riverine – on or near the banks of a river; of, like, or produced by a river or rivers

roadless construction - methods used in transmission line construction as an alternative to conventional construction methods designed to minimize harm to resources. Methods include overland, where vehicles and equipment use special tires designed to minimize damage to vegetation; and helicopter, where helicopters are used to haul equipment, crews, materials, and structures to the site.

RUS Rural Utilities Services (formerly REA) - An agency under the Secretary of Agriculture (USDA). Independent, nonprofit, consumer-owned business enterprise incorporated under the laws of the state in which it operates. Consumers who receive service are members of the cooperative and share responsibility for its success or failure along with the benefits they receive.

schedule - an agreed-upon transaction size (megawatts), start and end time, beginning and ending ramp times and rate, and type required for delivery and receipt of power and energy between the contracting parties and the Control Area(s) involved in the transaction.

scoping meeting - a meeting of all interested parties (government, private, and public) required by environmental protection laws to examine the concept and/or extent of a proposed action such as construction of a power plant or transmission line.

sensitive species - plant or animal species that are susceptible or vulnerable to activity impacts or habitat alterations. Those species that have appeared in the Federal Register as proposed for classification or are under consideration for official listing as endangered or threatened species, that are on an official placement on Federal or State lists.

service area - the territory in which a utility system is required, or has the right, to supply, or make available electric service to consumers.

short-term impacts - impacts occurring during project construction and operation, and ceasing upon project closure and reclamation.

significant effect - a substantial, or potentially substantial, adverse change in any of the physical conditions within the area affected by the project including land, air, water, minerals, flora, fauna, ambient noise, and objects of historic or aesthetic significance.

single circuit - the placing of one single electrical circuit (consisting of three phases) along a row of towers. In tower design, any tower capable of supporting only one circuit.

single contingency - the sudden, unexpected failure or outage of a system facility(s) or element(s) (generating unit, transmission line, transformer, etc.). Elements removed from service as part of the operation of a remedial action scheme are considered part of a single contingency.

single pole structure - this structure is considered an alternative to the H-frame design and could be used where a narrower ROW is required. Typical pole spans vary between 300 and 600 feet, and pole heights range from 65 to 97 feet above ground.

socioeconomic - pertaining to, or signifying the combination or interaction of social and economic factors.

substation - a location where several electrical circuits converge, and where electrical characteristics, such as voltage, are changed. Substations generally include transformers, switches, and short-circuit sensing and isolating devices.

substrate – a substance acted upon, as by an enzyme

supervisory control - a form of remote control comprising an arrangement for the selective control of remotely located facilities by an electrical means over one or more communications media.

Supervisory Control and Data Acquisition (SCADA) - A system of remote control and telemetry used to monitor and control the electric system.

swale - a hollow, depression, or low area of land; such a place in a wet, marshy area

tap - a connection to an electrical circuit with limited control capability

telemetering - the process by which measurable electrical quantities from substations and generating stations are instantaneously transmitted using telecommunication techniques.

threatened species - any species that is likely to become an endangered species within the foreseeable future throughout all, or a significant portion, of its range.

three-pole angle structure - a three-pole angle structure, with overhead ground wires, would be used at tangent angle locations. Typical pole heights would range from 61 to 88 feet above ground. These structures would be utilized where the line deflection angle exceeds 5 degrees. Either wood poles or darkened steel poles would be used.

topping - removal of up to one-third of vegetation (trees) to provide adequate conductor-to-tree clearance.

transformer - a device to change the operating voltage of alternating current electricity

transmission - an interconnected group of lines and associated equipment for the movement or transfer of electric energy between points of supply and points at which it is transformed **for delivery to customers or is delivered to other electric systems.**

bulk transmission - a functional or voltage classification relating to the higher voltage portion of the transmission system.

subtransmission - a functional or voltage classification relating to the lower voltage portion of the transmission system.

unavoidable effects - many effects, which could occur from the project, can be eliminated or minimized by management requirements and constraints and mitigation measures. Effects that cannot be eliminated are identified as unavoidable.

volt (V) - a unit of electrical potential difference. Electric potential difference is caused by the accumulation of electrons at one point in relation to another point.

volt-ampere - the basic unit of "Apparent power." The mathematical product of the volts and amperes of the circuit.

watt (W) - the basic unit for measuring power (or the rate of energy generation or consumption). The power required to do work at the rate of 1 joule per second. One horsepower is equivalent to approximately 746 watts.

watt-hour meter - instrument used to measure and record kilowatt-hour consumption (see "Meter').

wetlands - those areas that are inundated or saturated by surface water or groundwater at a frequency and duration sufficient to support, and that under normal circumstances, do support a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, etc. (See Jurisdictional Wetlands.)

wikiup (***var. wickiup***) - a kind of hut built by the nomadic Indians of the southwestern U.S. consisting of an oval-shaped frame covered with grass, brush, etc.

404 Permit - Section 404 of the Clean Water Act specifies that anyone wishing to place dredged or fill materials into the waters of the United States and adjacent jurisdictional wetlands shall apply to the U.S. Army Corps of Engineers for these activities is known as a 404 permit.

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Chapter 7

Distribution List

7 DISTRIBUTION LIST

Copies of the Final EIS were sent to those agencies, organizations, and individuals who commented on the Draft EIS or who requested to be on the FEIS mail list. Copies of the FEIS are also sent to local libraries and public information organizations, as well as selected regulatory agencies. Following is a list of recipients of the FEIS.

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Federal Railroad Administration, Environment Division
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USDI, Bureau of Land Management, Colorado State Office

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San Miguel County Planner
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Montrose County Planner

Montrose County Nucla Airport
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Telluride Daily Planet
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APPENDIX A-1

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TRI-STATE GENERATION AND TRANSMISSION ASSOCIATION AND SAN MIGUEL POWER ASSOCIATION FOR THE NUCLA-TELLURIDE PROJECT

November 2001

Appendix A-1

Description of Engineering, Design, Construction and Maintenance Practices

Submitted by:

Tri-State Generation and Transmission Association and San Miguel Power Association

for the

Nucla-Telluride Project

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1.0 TRI-STATE GENERATION AND TRANSMISSION ASSOCIATION

1.1 INTRODUCTION

Tri-State Generation and Transmission Association (Tri-State) is a nonprofit, wholesale power supply cooperative. It provides power to 44-member distribution cooperatives that serve major parts of Colorado, Nebraska, New Mexico and Wyoming. Tri-State also sells a portion of its surplus power (not currently required for the members' use) to other utilities in the region. Tri-State employs approximately 875 people in the three states. Tri-State was organized in 1952 by its member cooperative and is owned by those coops. Tri-State is guided by a 44-member board of directors - one director representing each of the members. Combined, the 44 members provide electric service to a population of more than 950,000.

Each of Tri-State's member utilities is a nonprofit organization owned by the consumers it serves. Each member has a board of directors comprised of consumers from its service area. Tri-State's 44 distribution members (18 in Colorado, 6 in Nebraska, 12 in New Mexico, and 8 in Wyoming) directly supply electricity to rural residences, farms and ranches, cities, towns, and suburban communities, as well as large and small commercial businesses and industries. Combined, there are over 476,000 meters in a 200,000 square mile area.

Like most major power suppliers, Tri-State must focus on both the present and future power requirements of its system. Tri-State's owned and contracted energy mix of coal-fired, oil-fired and hydroelectric resources total approximately 2,350 megawatts (MW) of generating capacity. Tri-State has ownership and operating interests in five major coal-fired plants - the Craig, Nucla, Escalante, San Juan and Laramie River Stations - that account for approximately 70 percent of its total energy resources. In addition, Tri-State receives an allocation of hydropower from the Western Area Power Administration. Together, these resources provide Tri-State with sufficient base-load generation to maintain a comparatively low-cost, reliable supply of power to its members well into the next century.

Tri-State owns (wholly or jointly), operates and/or has maintained responsibility for more than 5,348 miles of transmission lines (ranging from 115 kV to 345 kV), 135 substations and switching stations, and the David A. Hamill DC Tie at Stegall, Nebraska. The tie connects the eastern and western halves of the nation's power grid. Tri-State has members on both sides of the grid. The tie allows controlled transfers of up to 100 MW of power between the east and west grids.

To build its own facilities, or to pay its share of joint generation/transmission projects, Tri-State borrows money. Financing is arranged through the Rural Utilities Service (RUS) of the U.S. Department of Agriculture and the Federal Financing Bank, the National Rural Utilities Cooperative Finance Corporation, and the National Bank for Cooperatives. To qualify for this financing, Tri-State must comply with the regulations and requirements of these lenders.

1.2 DESIGN CHARACTERISTICS OF THE 115 kV TRANSMISSION LINE

The new transmission line would be constructed and operated at 115 kilovolts (kV). The capacity of the new transmission line would be approximately 55 megavolt amps (MVA) or megawatts (MW). The Project would be constructed as a single-circuit 115 kV transmission line. In areas where the transmission line would be placed on poles with another existing 115 kV line, a double circuit 115 kV system would be installed to support the lines. *Table A-1.2-1* summarizes the engineering design characteristics of the proposed transmission project.

1.2.1 Electrical Design

Tri-State designs, constructs, operates, and maintains transmission lines to meet or exceed the requirements of the National Electric Safety Code (NESC), RUS specifications, U.S. Depart-

ment of Labor Occupational Safety and Health Administration standards (OSHA), and all other applicable national design codes or standards. Tri-State's standard operating procedures (SOPs) are designed for the maximum safety and protection of the public, landowners and their property, as well as Tri-State's construction and operations personnel.

Table A-1.2-1
115 kV Transmission Line Specifications
Summary of Design Characteristics

Design Specification	Characteristics
Line Length	44.8 to 47.7 miles (depending on alternative)
Type of Structures	Two-pole H-frame or single wood, with three poles at angles. Some steel poles may be necessary
Right-of-Way Width	Single pole – 75 feet H-Frame – 100 feet Guyed structures would require additional width depending on terrain
Structure Heights	H-Frame structure – 61 feet to 88 feet Single pole structure – 65 feet to 97 feet Three-pole structure – 61 feet to 88 feet
Land Temporarily Disturbed (short term)	Pole structures (single, H-frame, three-pole designs) With conventional construction methods: 0.6 acre/pole (250 feet x 100 feet) With helicopter methods: 0.13 acre/pole (75 feet x 75 feet) - Wire pull and layout sites: 18-24 sites depending on alternative; approximately 0.2 acre/site (200-foot x 75-foot area) - Pole lay-down areas: 200-foot x 700-foot area (3.21 acres each) - Material and equipment staging yards: 3 sites, approximately 3.4 acres (200-foot x 250-foot area)
Land Permanently Disturbed (long term)	Structure base: Single pole structure – 7 square feet per pole H-frame structure – 14 square feet per pole Three-pole structure – 21 square feet per pole
Access Roads	New roads (14 feet wide) – 1.7 acres per mile
Voltage	115 kV
Structure Base	Direct buried (concrete would be needed on steel pole structures)
Span Lengths (approximate)	H-frame – 400 feet to 1,500 feet Single pole – 300 feet to 600 feet
Conductor and Hardware Size and Material	Conductor – 477 kcmill ACSR "Hawk," non-specular Ground wire – 3/8 inch galvanized steel Insulators – Lightweight polymer rubber w/non-reflective light gray color
Clearance of Conductor	Minimum of 24 feet, conductor to ground
Number of Structures per Mile	Single pole – 9 to 18 with average of 12/mile H-frame – 6 to 14 with average of 8/mile

All permanent Tri-State structures, such as fences, metal gates, and metallic structures, whose electric characteristics might be affected by the operation of the Project, would be grounded in accordance with NESC code. Additionally, lightning protection would be provided by one or two shield wires placed above the conductors on the transmission line. Tri-State designs their

transmission facilities to avoid raptor electrocutions and minimize the potential for collisions. Spacing of conductors would be designed in accordance with guidelines and recommendations outlined by the Avian Power Line Interactive Committee (APLIC), (Edison Electric Institute 1996; 1994). This design allows for sufficient phase-to-phase and phase-to-ground spacing of the conductors in order that raptor electrocutions do not occur.

1.2.2 Physical Design

A variety of pole designs and materials would be used for the Project. The type of pole used would depend upon a variety of factors including: 1) terrain conditions, 2) landowner preferences, 3) the angle of the line; 4) whether the pole needs to support SMPA's distribution system; and 5) whether the structure would also support another existing 115 kV line, currently owned and operated by Tri-State.

The single circuit 115 kV transmission line would primarily be supported on wood pole structures. In general, single poles are expected to be built across most private lands such as agricultural and community areas, while H-frame poles would most likely be used on public lands. Tri-State would consult with private landowners regarding specific pole design options on their property and would construct structures on public lands in accordance with federal and state land management agency requirements. The new 115 kV single pole structures would support SMPA's distribution system, as an underbuild, along portions of the line where both facilities are needed. Three-pole structures and tubular steel pole structures would also be required in some locations, depending upon terrain conditions and the angle of the transmission line. Structures would be guyed at angle points for stability. ***Figures A-1.2-1, A-1.2-2*** and ***A-1.2-3*** show these various structure designs. Final pole types, placements, and heights would be determined in consultation with the Forest Service, BLM, and private landowners. Federal planning guidelines, specialist input and landscape visual guidelines would be used as part of the final design and siting process. Ground wires would be installed on all poles to provide for protection against lightning. Ground wires typically consist of ⅜-inch galvanized steel. The ground wires would also be used to carry fiber optic communications cables.

H-Frame Structure. H-frame structures typically support three conductors and two ground wires (also known as shield wires). Spans between structures would vary between 400 and 1,500 feet, depending upon terrain, with an average span of about 800 feet. Typical pole heights would be 61 to 88 feet above the ground, depending upon terrain, with a maximum height of 100 feet. These structures would be utilized primarily across undeveloped open space where the line deflection angle is less than five degrees *(see **Figure A-1.2-1 (a)**)*. Long-term land loss for H-frame structures would be approximately 14 square feet per structure.

Three-Pole Structures. Typical pole heights would be 61 to 88 feet above the ground, depending upon terrain conditions. These structures would be used where H-frame structures are used and the line deflection angle exceeds five degrees or is dead-ended. These structures would require down guy wires with deadman type anchors to resist imbalanced tension of the conductors and shield wires at angles in the alignment. The number of anchors and guys would vary with the structure type. *(**Figures A-1.2-1 (b)** and **(c)**)*. Permanent land loss for three-pole structures would be 21 square feet. Additional land would be required where structures are guyed.

Single Pole Structures. Single pole structures support three conductors, two on one side and one on the opposite side, and a single shield wire at the top of the pole *(**Figure A-1.2-2**)*. Typical spans between single poles would be 300 to 600 feet, with a typical span of approximately 450 feet. Typical pole heights would be 65 to 97 feet above the ground, depending on the terrain. Maximum height would be approximately 100 feet. Single poles would be guyed in locations where the deflection angle exceeds five degrees or the line is dead-ended.

(Figures A-1.2-2 (b), (c) and *Figure A-1.2-3 (b))*. Long-term land loss would be approximately seven square feet per single pole structure. Additional land would be required where poles are guyed.

Single poles would also support SMPA's distribution system as an underbuild *(Figures A-1.2-3 (a), (b)* and *(c))* in selected locations. A double circuit, single pole structure would also be used where the proposed line could be combined with another 115 kV transmission line *(Figure A-1.2-3 (d))*.

Insulators would be a dull grey, lightweight polymer rubber. Conductors would be non-specular dulled 477 MCM, Aluminum Conductor Steel Reinforced (ACSR). For lightning protection, a ⅜-inch grounded shield wire would be installed. Colored marker balls (alternating orange, white and yellow) may be required by the Federal Aviation Administration (FAA) where the 115 kV conductor or shield wire reaches 200 feet above the ground (FAA 1991). Areas that may require marker balls typically include canyon crossings. The design characteristics of the 115 kV line are summarized in *Table A-1.2-1*.

1.2.3 115 kV Right-of-Way

The single circuit 115 kV line would require a right-of-way varying in width from 75 feet to 100 feet. The width of the right-of-way, and the restrictions within it, would be determined by electrical safety codes, and are proportional to voltage. A 75-foot-wide right-of-way would be required where single pole structures are constructed. One hundred (100) foot-wide rights-of-way would be obtained where H-frame and 3-pole structures are installed.

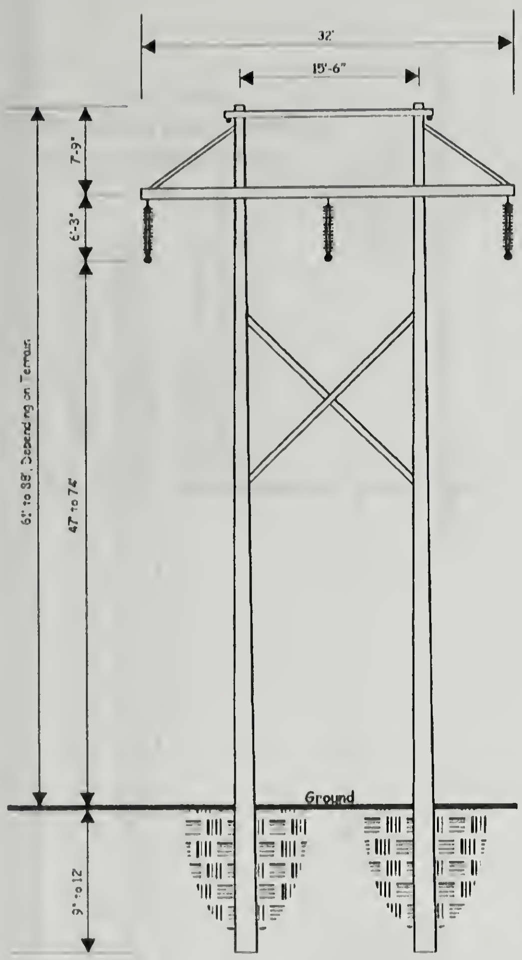
On public lands, Tri-State would acquire a Special Use Permit from the Forest Service, or a Right-Of-Way Grant from the BLM and State of Colorado, which would allow Tri-State to construct, operate, maintain, and rebuild the transmission facility.

On private land, Tri-State would acquire sufficient easements to locate, construct, operate, maintain and rebuild the transmission line. All rights would be acquired in accordance with applicable state laws governing acquisition of property rights. Landowners would be paid fair market value for the rights acquired across their property, plus any damages resulting from construction, future operation and maintenance.

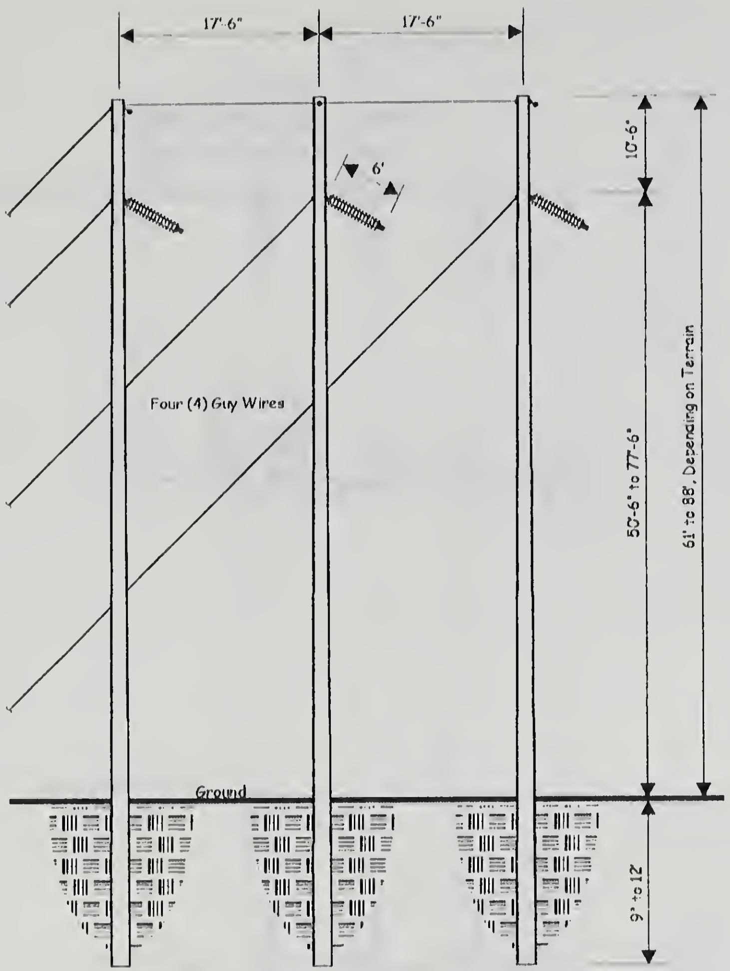
The easement rights acquired by Tri-State would allow the utility to maintain the integrity of the electric line, allow normal and routine maintenance and access, and provide for the safety of Tri-State employees and the public, including fire safety. The easements would provide the right to clear and to keep clear the easement strip from buildings, large equipment, stockpiles, combustible or explosive materials. Vegetation within the right-of-way would also be managed to maintain necessary ground and conductor clearances. The clearance between a 115 kV conductor and vegetation is normally 18 feet. ***Figures A-1.2-4*** and ***A-1.2-5*** show typical vegetation clearances required for a 115 kV transmission line.

1.2.4 Access

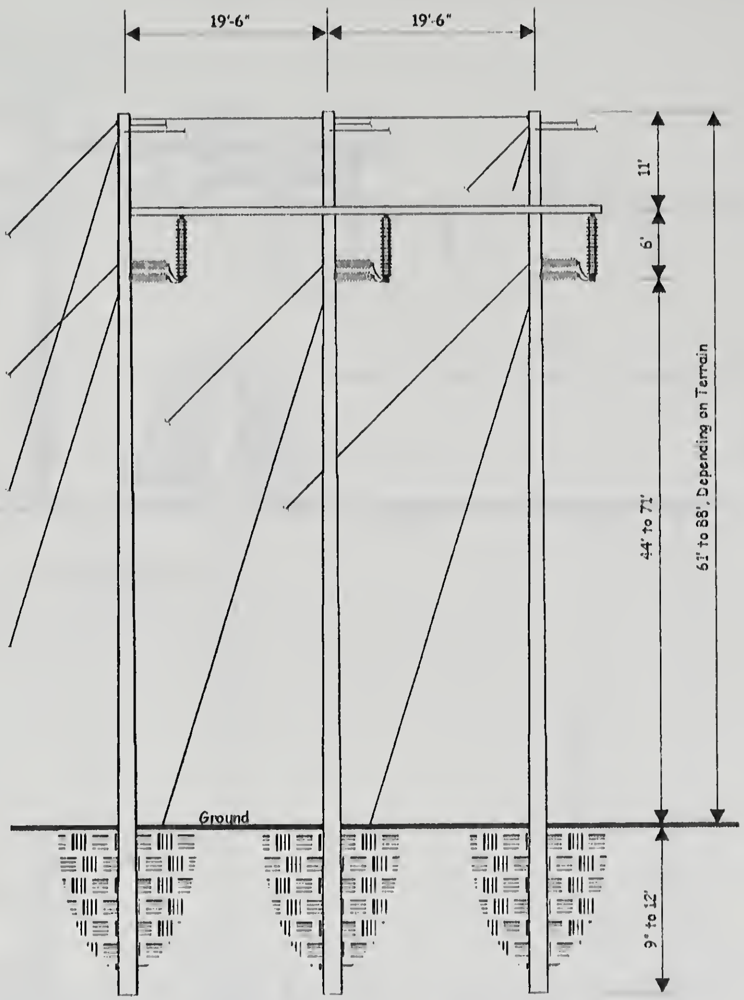
Tri-State would utilize existing access, where available; and, depending on the alternative selected, build spur roads to individual pole sites and/or improve or widen existing access, where allowed by the BLM or private landowners. No new roads would be constructed on National Forest lands. Roads for the construction of the Project would need to be 12 feet to 14 feet wide to allow for the movement of equipment and crews. Rights-of-way for roads would be obtained from the BLM and Forest Service, as needed. Minor new spur roads to individual pole sites would be constructed off of existing roads, where feasible and approved by landowners and agencies. 'Overland' construction methods and 'helicopter' construction would be used in areas with no existing access or where existing access is inadequate and not approved for widening or other upgrading. 'Overland' methods are defined as obtaining access to the



a
115 kV Single Circuit
H-Frame Tangent Structure
(TH-10VOX)



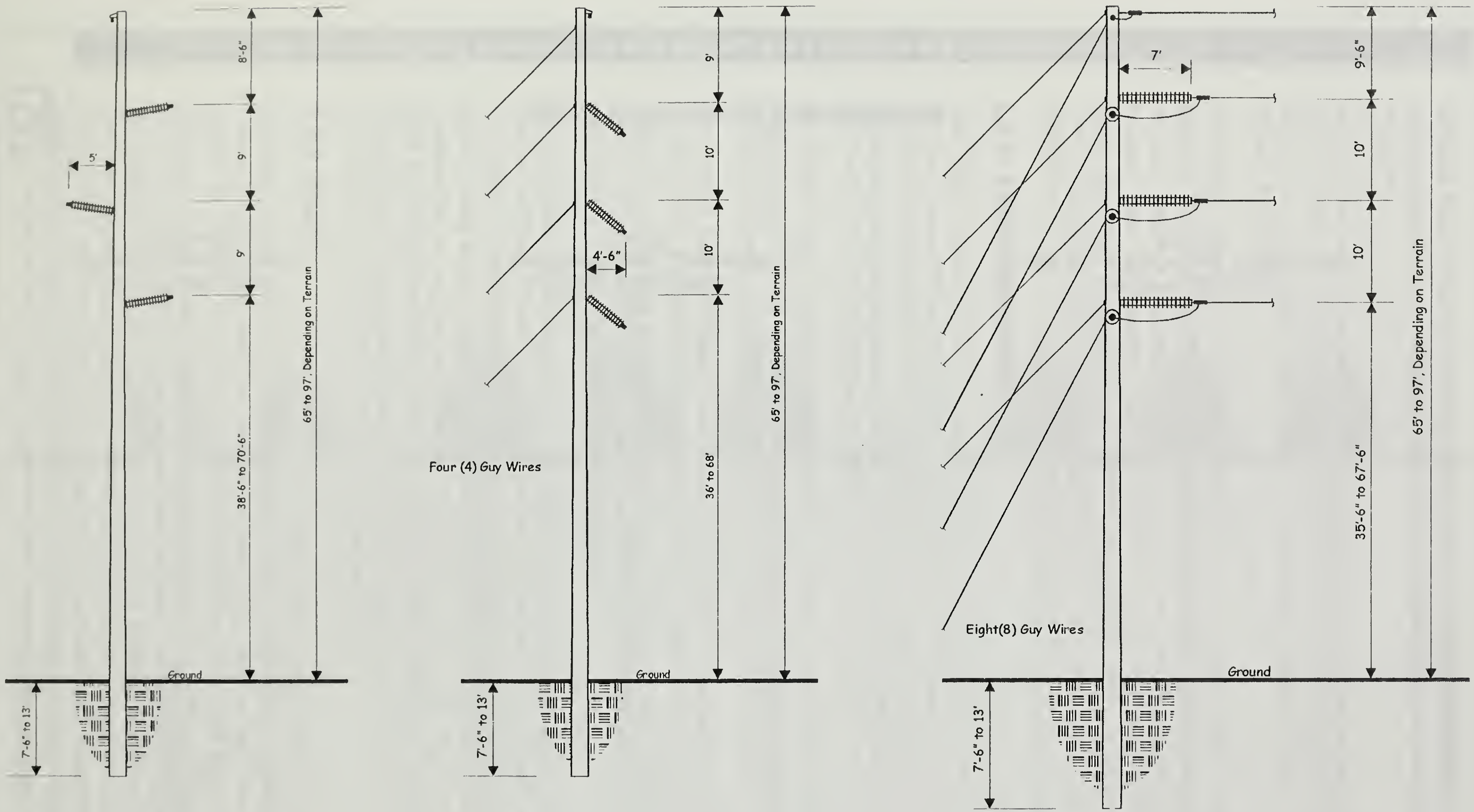
b
115 kV Single Circuit
Triple Wood Pole - Large Angle
(TH-14)



c
115 kV Single Circuit
Triple Wood Pole - Large Angle Deadend
(TH-15)

Typical H-frame and 3-Pole Structures

Figure A-1.2-1



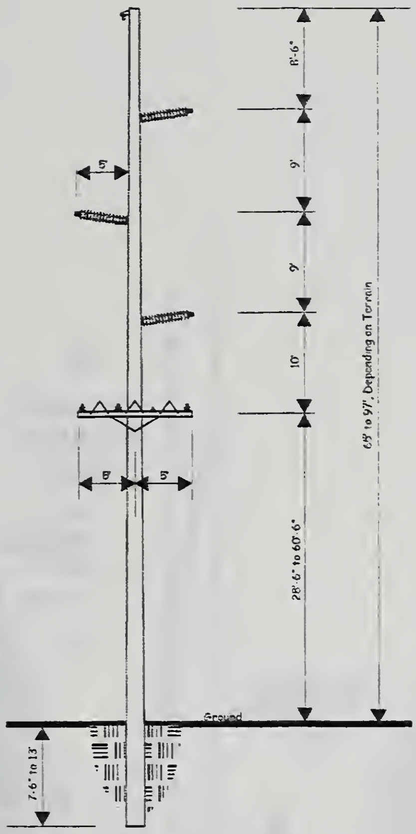
a
115 kV Single Circuit
Single Wood Pole - Tangent
(TP-115)

b
115 kV Single Circuit
Single Wood Pole - Angle
(TS-4A)

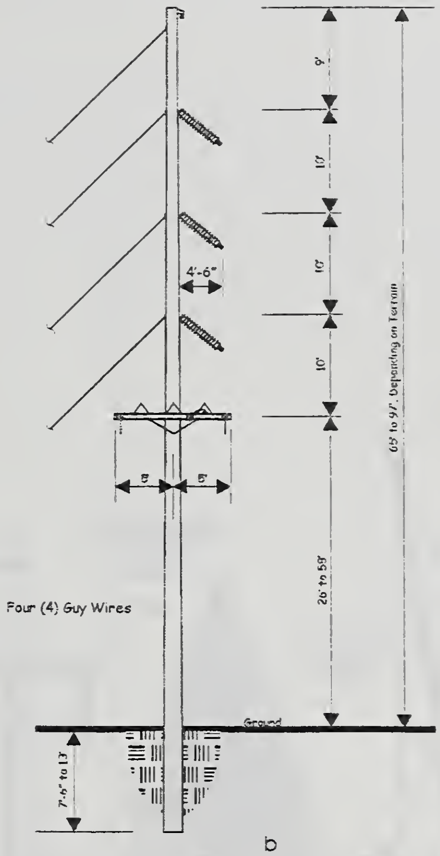
c
115 kV Single Circuit
Single Wood Pole - Deadend
(TS-5A)

Figure A-1.2-2

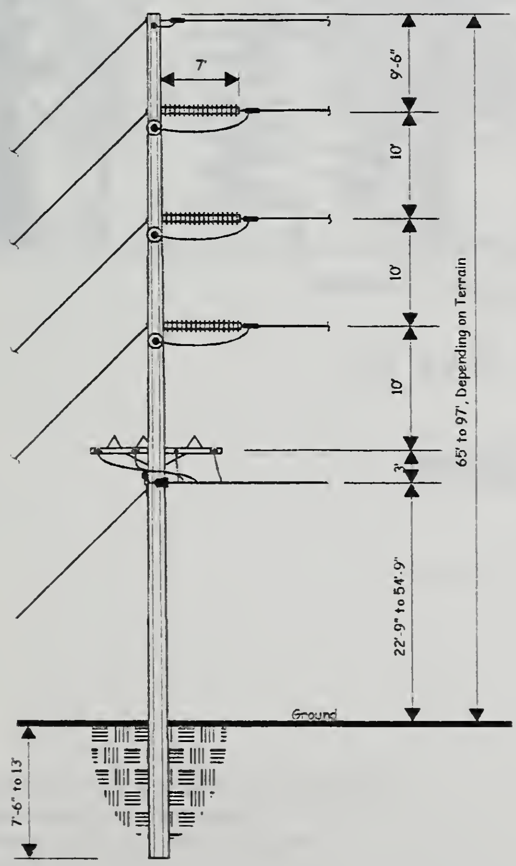
Typical Single Pole Structures



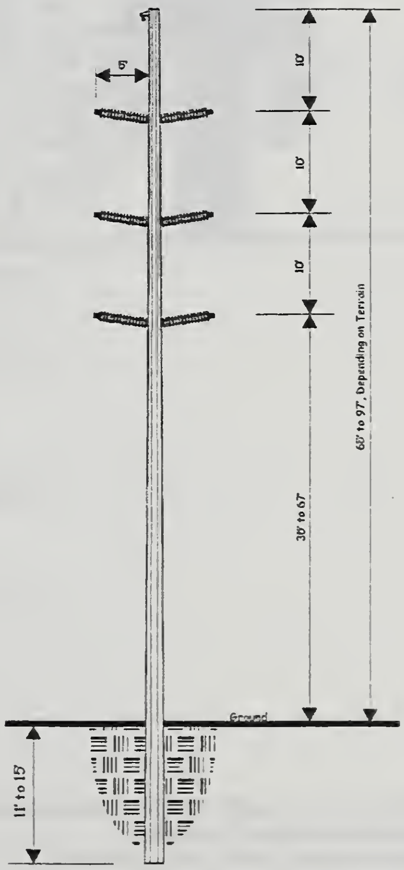
a
115 kV Single Circuit with Underbuild
Single Wood Pole - Tangent
(TP-115 w/VC9-3)



b
115 kV Single Circuit with Underbuild
Single Wood Pole - Angle
(TS-4A w/VC8-I)



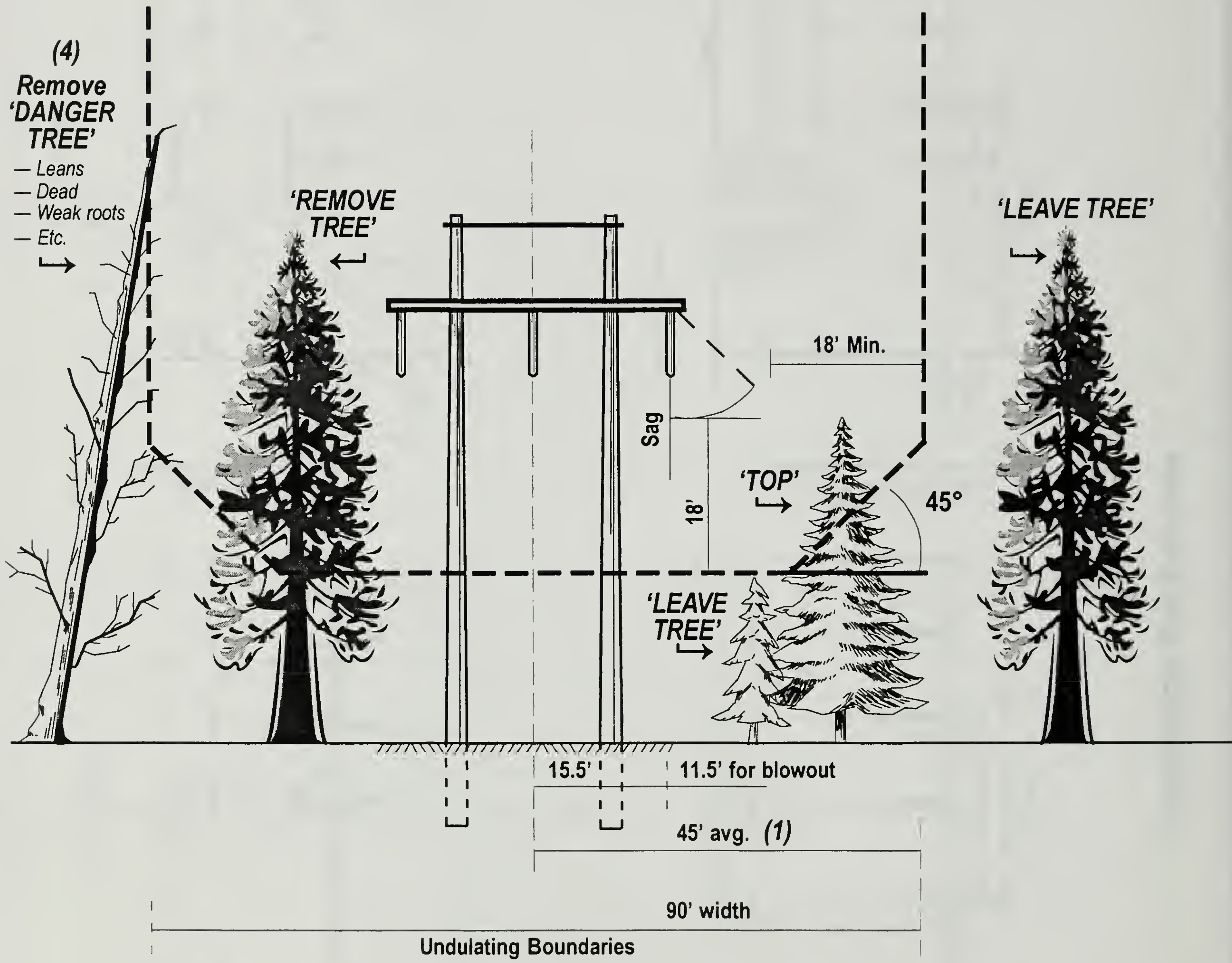
c
115 kV Single Circuit with Underbuild
Single Steel Pole - Deadend
(TS-5A w/VC7-IM)



d
115 kV Double Circuit
Single Steel Pole - Tangent
(TP-I-DC)

Single Pole Structures for Distribution Underbuilt and Double Circuit 115 kV System Conditions

Figure A-1.2-3



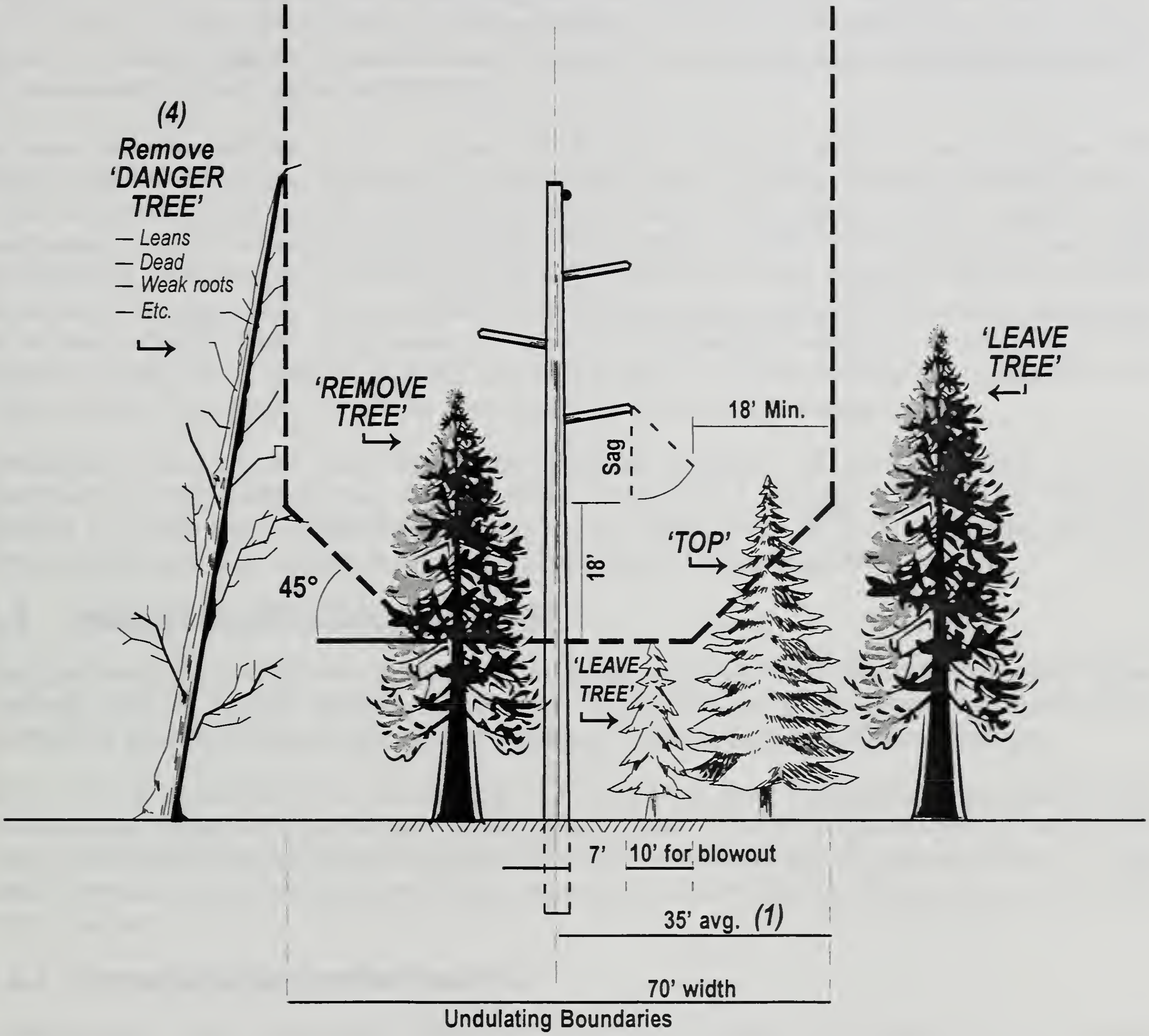
Source: Tri-State, 1998.

Notes

1. Center of 90' width may vary from actual centerline due to side slopes.
2. All trees will be identified and marked for treatment.
3. Basic clearance from conductor (212°F., Final) to be 18 feet.
4. 'Danger Trees' will be outside right-of-way.

Typical Transmission Line Right-of-Way Clearing for H-Frame Structures

Figure A-1.2-4



Source: Tri-State, 1998.

Notes

1. Center of 70' width may vary from actual centerline due to side slopes.
2. All trees will be identified and marked for treatment.
3. Basic clearance from conductor (212°F., Final) to be 18 feet.
4. 'Danger Trees' will be outside right-of-way.

Typical Transmission Line Right-of-Way Clearing for Single Pole Structures

Figure A-1.2-5

Project right-of-way or pole sites by driving equipment over grasslands, shrubs and other low lying vegetation. Overland construction would be used in areas where slopes do not exceed 12 percent and vegetation is not sensitive and consists of low-lying grasses and shrubs. Vehicles and equipment would use special tires designed to provide minimal damage to the vegetation. Only predefined routes to the poles, pulling stations, etc. would be used. Ground cover would be trampled; however, most vegetation would recover within five years. In areas where overland construction methods and equipment are used, ground disturbances would be approximately 0.6 acre per structure site.

In areas where vegetation and/or slopes do not permit overland construction or access road improvements, helicopter methods and foot crews would be used. Roadless construction at these locations would require work to be done by hand. Helicopters would be used to haul equipment, crews, materials and structures to the sites. In areas with limited access, some groundwork would be done with the use of ATV's or small trucks. Digging of holes for poles, anchors, or fencing would be accomplished by using portable equipment including generators or by hand digging. Helicopters would be used for the hauling, setting, and plumbing of the structures and the structural backfill. In areas where helicopter construction methods are used, ground disturbances would be approximately 0.13 acre per structure site.

Preliminary access plans have been developed for purposes of the EIS analysis and are described in the transportation section. ***Plates PROJECT-3*** through ***-7*** show the type and amount of access that is anticipated for the 115 kV alternatives. Final access plans would be developed during final design, when specific pole locations are identified.

1.3 PROJECT CONSTRUCTION ACTIVITIES

The proposed Nucla-Telluride Project would be constructed by Tri-State using conventional methods and/or special roadless techniques. A description of the proposed conventional methods is presented below, followed by the special roadless construction techniques.

Table A-1.2-1 summarizes the short-term and long-term land disturbances associated with conventional construction activities. "Short term" refers to the construction period and subsequent time period during which vegetation would be re-established on disturbed areas. "Long term" pertains to the period during which maintenance activities are taking place or over the life of the line.

1.3.1 Conventional Construction Practices

Construction of the transmission line would generally follow a sequential set of activities performed by a small crew proceeding along the length of the line. The activities include.

a. Surveying and engineering
b. Development of access roads, wire handling areas and construction lay-down sites
c. Selected topping and clearing of vegetation
d. Material hauling
e. Excavation of pole holes
f. Structure assembly and erection
g. Conductor and overhead ground wire installation (wire-stringing)
h. Post-construction cleanup
i. Revegetation

Each step is described below. *Table A-1.3-1* summarizes typical workforce sizes and the amount of time needed for each step.

Table A-1.3-1
Personnel and Equipment Required for Construction of 115 kV Overhead Lines

Activities	Crew Size	Equipment	Length of Time
Surveying & engineering	3 3-person crews	1 utility vehicle and ATV per crew	4-5 months
Development of access roads, wire handling area and construction lay down sites	5 to 10 people	2 D-6 Caterpillars 2 all-wheel-drive motor graders 2 10-wheel dump trucks 2 water trucks	3 months
Selective topping and clearing of vegetation	4-6 people	2 pickups 1 chipper	Forests - 1 week per mile; rangeland - none
Material hauling	2-3 people per truck	2 pickup trucks 4 flat bed trucks with cranes 2 pole delivery trucks	1 month
Excavation of pole holes	3 3-person crews	2 rotary drilling rigs 4 backhoes 6 pickups	4 months
Structure assembly and erection	2 4-person crews	6 pickups/carryalls 2 cranes 6 boom trucks 3 material trucks (5 tons) helicopters	6 months
Conductor and overhead ground wire installation	16 to 21 people	3 pickups 3 manlifts/boom trucks 2 hydraulic tensioning machines 2 reel trailers	5 months
Post-construction cleanup	6 people	2 pickups 2 dump trucks 2 flatbed trucks	5 weeks
Revegetation	6 people	2 pickups 2 flatbed trucks 1 backhoe 1 D-6 Caterpillar Seeding equipment	6 weeks

Surveying and Engineering

Once the final alternative has been selected, permits have been obtained from the counties and permission acquired from landowners, initial surveying would be done to mark the centerline of the transmission line with ground panels for aerial photography and verification of property line locations. In extremely rough terrain or dense vegetation, manual centerline profile surveying may be required. With the resulting profile and field visits, specific structure locations would be determined. The centerline will be flagged for use in cultural resource surveys. This will require clearing a narrow line of sight along the route. Prior to construction, final surveying and staking would be completed for the proposed structure location, anchors, guys and access roads. Depending upon the structure location, access would be obtained from existing roads, recovery of abandoned roadbeds or new roads.

A geotechnical survey would be performed to determine the soil and rock strengths for foundation design. Small drilling rigs would be used. In order to minimize impacts to vegetation, this survey would be conducted from existing roads, or by foot or ATV in inaccessible areas.

Development of Access Roads, Wire Handling Areas and Construction Lay-Down Sites

Construction and operation of the transmission line would require the movement of large vehicles along the ROW. Existing roads and trails would be used for access to structures when possible. In locations where suitable roads or trails do not exist, new access trails would be

constructed or roadless construction methods utilized. Access roads are typically 14 feet in width, with a cross slope no more than two percent and a maximum grade not exceeding 12 percent. In areas of steep slopes or broken terrain, access roads would be from short spur roads rather than from within the transmission line ROW. In such cases, the minimum wing radius of the inside of the curves would be 60 feet.

Clearing of vegetation for the access roads would be limited to the minimum necessary to provide passage of the construction vehicles. Treatment or disposal of slash material will be determined prior to project implementation and approved by the Forest Service, BLM and/or the landowner.

Wherever possible, access roads would be aligned to cross streams and washes at right angles, and would normally cross intermittent streams without culverts. If a stream is narrow with steep, high banks, a culvert sized in accordance with federal, state and local floodplain protection standards would be installed. These roads would be used for construction, operation and maintenance of the transmission line, and as part of this activity, gates or cattle guards would be installed wherever an access road crosses an existing fence.

Ten to 12 wire handling or pulling sites would be required. These sites must be on the transmission line centerline and are normally located at the heavy angle structures (angles greater than 30 degrees). The wire handling or pulling sites are typically 200 feet by 75 feet in size. In timbered areas, additional trees may have to be topped or side cut to allow room for the wire to be pulled into or out of the area without interference. Some grading and leveling may be required at these sites.

Construction lay-down areas are used to layout, frame and assemble poles prior to taking them to the site for installation. These require an approximately 200-foot by 700-foot area.

Selective Topping and Clearing of Vegetation

Trees and other vegetation in the ROW would require selective clearing to provide suitable access for the construction, operation and maintenance of the transmission line. Clearing would be done in accordance with *Environmental Criteria for Electric Transmission Systems* (U.S. Department of the Interior and U.S. Department of Agriculture 1970). The clearance between a 115 kV conductor and vegetation is normally 18 feet. This will provide three to five years growth. When clearing for conductors, vegetation would be removed or topped to the minimum extent necessary to provide adequate clearance. In instances where it is necessary to remove short swaths of trees, the edges of these areas would be made irregular to preserve a natural appearance. Trees would be side cut periodically (about every four to six years) to maintain the electrical conductor-to-tree clearance. Trees may also be topped within the ROW to maintain a natural appearance. If more than one-third of a tree needed topping, the tree would likely die; therefore, the tree would be removed entirely.

Any vegetation or trees that were cleared would be disposed of as directed by the landowner. Options include stacking of material, lopping and scattering of material, or brush piles. Disposal of slash, stumps and roots will be determined by the Forest Service, BLM or landowner.

Material Hauling

Depending on the route selected, two or three temporary construction material yards (marshalling yards) would be required. These marshalling yards would serve as reporting locations for workers, parking spaces for vehicles, locations for office trailers (two to four), and locations for equipment and material storage. The fenced material yards are estimated to be approximately 200 feet by 250 feet in size. Construction lay-down areas may also be located at the marshalling areas. These would be two or three pole lay-down areas, 200 feet by 700 feet in size, used for pole storage and structure assembly. Existing open spaces would be used for

marshalling yards. Some grading work may be required to ensure minimal damage to the surrounding area.

Excavation of Pole Holes

Two different foundations would be used depending on the pole type. The first is simply an augered hole approximately 2.5 feet in diameter and 7.5 to 13 feet deep. These holes would remain open until the structure is placed. Structure placement would be done as soon as possible to prevent cave-in of the hole and danger of accidents. This simple foundation would be used with wood poles and direct-embedded steel poles.

Steel pole strain structures will require reinforced concrete foundations. This will require excavation of a 6- to 8-foot diameter hole, 18 to 25 feet deep. Anchor bolts are then embedded in reinforced concrete (10 to 15 cu. yd.) filling the hole.

Wood pole angle structures require guy/anchors to be installed. The guy/anchor carries the conductor and OHGW tension to the ground. Anchors would be installed by augering a hole in the ground and placing an anchor rod and plate at the bottom. Backfill material is then placed in the hole. In clay soils, a screw anchor would be used. Concrete may be needed to anchor certain structures. Local sources will be used to supply concrete. A portable concrete mixer would not be required. In rocky areas, heavy equipment or explosives may be required to break the rock prior to excavation.

Structure Assembly and Erection

Structure assembly will be completed near the foundation for each structure. Assembly would include drilling, fitting together crossarms, insulator hardware, stringing rollers, etc. Cranes would then be used to lift and place the structure in the foundation hole or on the anchor bolts. Boom trucks or cranes would be used to straighten and plumb the structure. Backfill material would then be placed around the structure and tamped in place.

Conductor and Overhead Ground Wire Installation

Reels of conductor and overhead ground wire (OHGW) would be delivered to the various wire handling/stringing sites along the ROW. These 200-foot by 75-foot temporary sites would be located within or adjacent to the ROW and typically near large angle structures. Equipment would include reel trailers with conductor, OHGW and pulling rope, and tuggers (hydraulic tensioning machines). The pulling rope is placed in stringing blocks located on each structure from a truck or by personnel walking the centerline, or from helicopters. The pulling rope is then connected to the conductor or OHGW and used to pull these wires down the line. Care is used to ensure that the wires do not touch the ground or trees. Crews would then traverse the line, securing the wires with insulator support clamps and removing the stringing rollers. To protect against accidental contact during the stringing operations, guard poles would be installed at all public roads, railroads, highways and utility line crossings.

Post-Construction Cleanup

Throughout the construction period, waste materials would be removed from the ROW and all other work sites. After construction, all surplus building equipment, lumber, refuse, fencing, etc. would be removed. Any disturbed land not necessary for maintenance or permanent access would be reclaimed to preconstruction conditions.

Revegetation

Slope stabilization and soil loss prevention would be controlled by the following methods:

- Topsoil would be stripped and stockpiled in areas of major disturbance and respread

following construction.

- All disturbed areas (i.e., all areas scarred, defaced or damaged as a result of construction) would be regraded, shaped and smoothed to contours close to the original, or if this is not feasible, to natural-appearing contours to avoid the creation of ponding or washouts. Such areas would include:
  - Construction access not required for maintenance access
  - Structure areas leveled for equipment, except those areas to be used for maintenance access
  - Wire handling areas
  - Marshalling yards
  - Pole storage areas
  - Borrow pits
- To minimize erosion, water bars and approved dried grass would be placed in possible problem areas.
- On completion of regrading work, all areas except the running surfaces of access roads would be scarified and left in a condition that would facilitate revegetation.
- Water turnoff bars or small terraces would be constructed across all maintenance access roads that have slope sufficient to cause gullying. All access roads would be outsloped.
- All disturbed areas would be seeded with native grass/brush species compatible with surrounding vegetation. The intent is to achieve a rapid vegetation cover that will reduce soil loss to a level close to that of the original vegetation. Seed mixtures and season and rates of application would be provided by appropriate land management agencies and landowners. Problem areas would be seeded annually until such areas are satisfactorily stabilized.
- Where necessary to achieve rapid revegetation, disturbed areas may also be mulched and fertilized. Types and rates of fertilizer application and types of mulched material would be provided by appropriate land management agencies and landowners.

1.3.2 Special Roadless Construction Practices

Roadless construction is an alternative to the conventional methods discussed above. The sequential tasks to be completed would be the same. The methods and equipment to accomplish these tasks would vary however, as would the construction crew sizes and amount of construction time.

Two general approaches to roadless construction would be used - overland and helicopter. Techniques used would depend on terrain and vegetation conditions, as well as other environmental constraints such as the presence of rare plants and cultural resource sites.

Overland

In areas where slopes do not exceed 12 percent and vegetation is not sensitive and consists of low-lying grasses and shrubs, overland methods would be used to reach the ROW and/or pole sites. Vehicles and equipment would use special tires designed to ensure minimal damage to the vegetation. Only predefined routes to the poles, pulling stations, etc. would be used. Ground cover would be trampled; however most vegetation would recover within five years and soil erosion would be kept to a minimum. The types of equipment and methods used would be the same as previously described for conventional methods.

Helicopter

In areas where terrain and slopes are prohibitive to construction access roads for conventional construction methods, helicopter methods would be used. Roadless construction at these locations would require most of the work to be done by hand. Helicopters would be used to haul equipment, materials and structures to the sites. Construction personnel would either hike into the site or be transported by helicopter. Digging of holes for poles and anchors would be done by using portable equipment, including generators or by hand digging. Helicopters would be used for the hauling, setting and plumbing of the structures and the structural backfill.

If the terrain requires helicopter construction, the structure would be assembled at the pole lay-down areas. The helicopter would then lift and fly the structure (or part of the structure) to the given structure site. Straightening and plumbing the structure would be completed by a ground crew using ropes and brace poles. All material would be flown into the structure site. Because of the elevation of the Project (from 7,500 to 10,000 feet), the lifting capability of the helicopter would be limited. This might require several lifts (flights) per structure.

Several areas may be used to assemble the structures and function as the helicopter staging areas. Crossarms and insulators would be assembled at the staging area and hauled to the site using the helicopter. Finally, wire stringing would be accomplished via helicopter.

Temporary landing zones, approximately 200 feet in diameter, would be required for refueling the helicopters. The soil at these areas may require treatment with a Forest Service and BLM approved product known as "Calbinder Ammonium Lignin Sulfonate." This treatment is necessary for dust control to minimize the possibility of damaging the helicopter rotor blades as well as the jet engines. Although the above-mentioned product acts as a defoliant, it will dissolve with time. The breakdown time depends largely on the elements of rain, snow, etc.

Specific areas where helicopter construction is proposed by Tri-State are described in EIS Chapter 2.0. Helicopter construction may require additional land crew personnel and equipment on the ground. All other aspects of construction and reclamation would be the same as described for "Conventional Methods".

2.0 SAN MIGUEL POWER ASSOCIATION

2.1 DESIGN CHARACTERISTICS OF DISTRIBUTION SYSTEM MODIFICATIONS

2.1.1 Location and Design

Depending upon the alternative selected, a variety of modifications would be required to SMPA's existing distribution system in order to ensure that service to their customers is maintained. Modifications would vary depending upon the alternative. Types of modifications that may be necessary include:

1. Converting existing overhead and underground single-phase lines to three-phase lines
2. Undergrounding new distribution lines
3. Constructing new overhead lines
4. Underbuilding distribution facilities on the new 115 kV transmission line
5. Undergrounding distribution that is presently underbuilt, in order to provide space for the new 115 kV line to be carried on a double circuit structure with other 115 kV facilities.
6. Retaining portions of the existing 69 kV structures to support local distribution lines

EIS *Plates PROJECT-3* through *-8* show where modifications may be required on SMPA's system for the transmission alternatives and subalternatives. *Table A-2.1-1* summarizes the types of distribution system changes required for each of the alternatives. Pole designs associated with the 115 kV distribution underbuilt are illustrated in ***Figures A-1.2-3 (a), (b)*** and ***(c)***. ***Figures A-2.1-1 (a), (b)*** and ***(c)*** illustrate the distribution pole designs. On overhead distribution lines, insulators would be a porcelain brown material and lines would be non-specular 4/0AWG,ACSR.

SMPA would obtain rights-of-way from the Forest Service and BLM for the use of roads on public lands during construction or operation of the facilities. Rights-of-way would be approximately 50 feet in width and vary in length by alternative.

Table A-2.1-1
Potential Modifications to SMPA Distribution Systems

Distribution Modifications Required	ALTERNATIVE				
	Nucla-Norwood Alternatives			Norwood - Sunshine Alternative	Norwood - Telluride Alternative
	N-N Northern Alternative	N-N Central Alternative	N-N Southern Alternative		
New Overhead Distribution Built *(miles)*	0.0	0.0	0.0	4.0	2.0
Existing Distribution Underbuilt on 115 kV Transmission Line (*miles*)	1.5	0.5	0.0	3.2	5.4
Underground Distribution Lines *(miles)*					
New underground lines constructed.	0.0	0.0	0.0	0.0	1.1
Overhead lines converted to underground.	0.0	0.0	0.0	0.4	1.2
Existing 69 kV Structures Retained for Distribution *(miles)*	0.0	1.0	1.5	0.0	2.1
Existing 69 kV Structures Removed *(miles)*	69 kV structures replaced with 115 kV structures	10.7	15.3	Existing 69 kV structures replaced	10.4

2.1.2 Electrical Capacity

The voltage of distribution lines installed in conjunction with the Project would be 24.9 kV.

2.2 DESIGN CHARACTERISTICS OF SUBSTATION MODIFICATIONS

A number of substations would need to be modified for the Project. The existing Norwood Substation would either be enlarged at its present location (Site A Alternative) or constructed at a new site (Site B Alternative), located approximately one mile to the southeast. Minor substation changes would also be required at the Nucla Substation, the Specie Mesa Substation, and, depending upon the alternative selected, at either the Telluride or Sunshine Substation and the Wilson Mesa Substation.

Several existing substation facilities may also be dismantled. The Oak Hill Substation would be dismantled regardless of the transmission alternative selected; and the existing Norwood Substation and Wilson Mesa Substation could be dismantled depending upon the alternative selected. Each of these substation changes is described below.

2.2.1 Norwood Substation Alternatives

To improve the quality of service in the Norwood area, Tri-State and SMPA are proposing to enlarge and upgrade the existing Norwood Substation. The existing substation occupies approximately 0.13 acre within the fenceline. Expansion of the Norwood Substation (Site A Alternative) would enlarge this facility to approximately two acres. An alternative to expanding the substation at its current site would be to build the substation facility at Site B. *Table A-2.2-1* summarizes the design characteristics of the Norwood Substation alternatives.

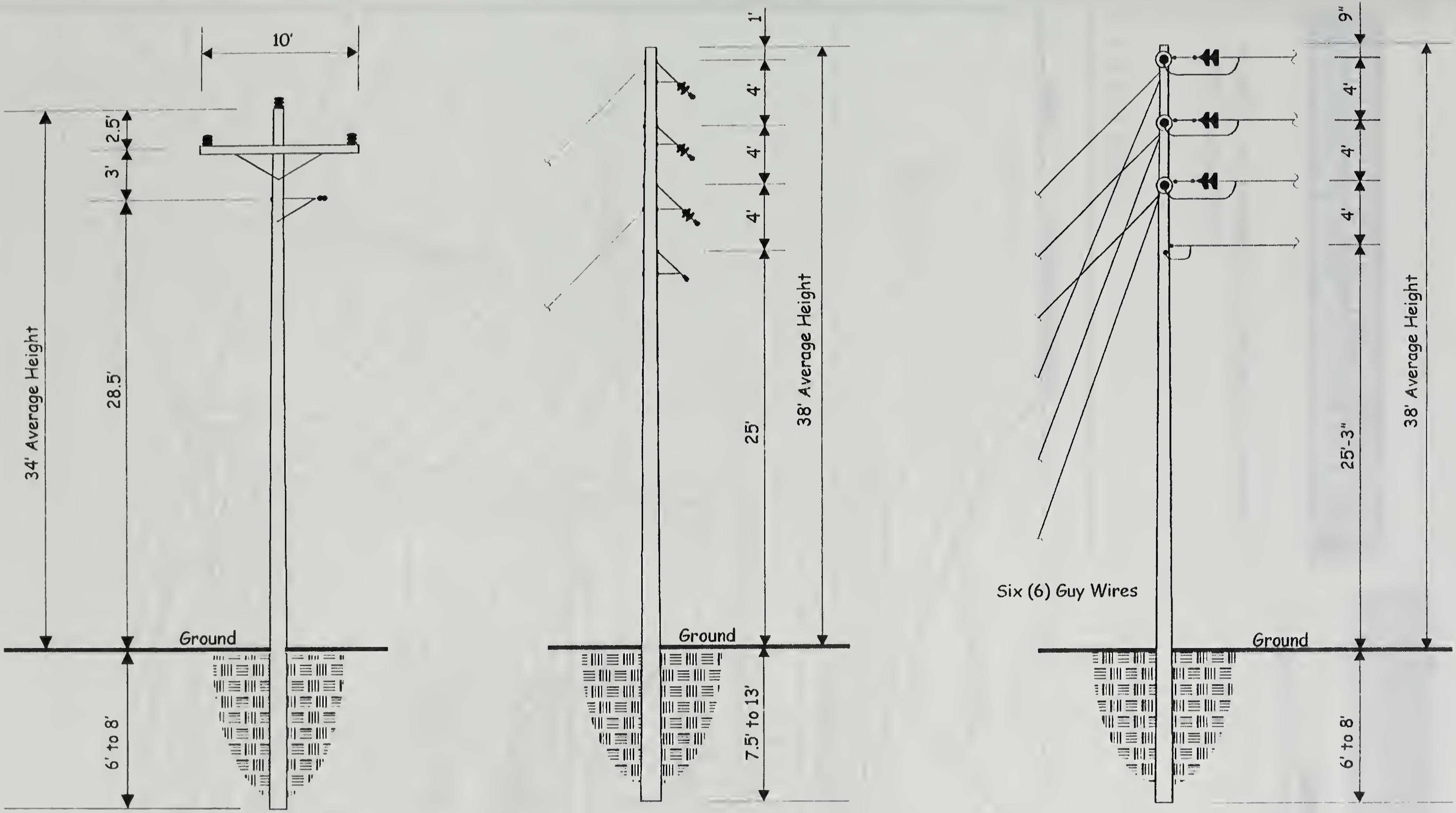
The Norwood Substation currently has a capacity of 3.75 MVA/MW. The new facility would be sized to accommodate 10 MVA/MW. The existing 30-foot tall switchracks would be replaced with tubular steel structures with a maximum height of 50 feet. The existing substation would remain in service until construction of the new substation was completed. The existing substation would be dismantled once the new substation facility was operational. *Table A-2.2-1* summarizes the equipment for the new Norwood Substation facility and ***Figures A-2.2-1*** and ***A-2.2-2*** show the site plans for Alternative Sites A and B.

Table A-2.2-1
Norwood Substation Alternatives – Design Characteristics

CHARACTERISTICS	SITE A	SITE B
Fenceline Dimensions:	165 x 220 feet	165 x 220 feet
Substation Pad Elevations:	7190 feet amsl	7433 to 7450 feet amsl
Total Size:	2.0 acres	2.0 acres
Cuts and Fills:		
Substation Size with Cuts & Fills	240 x 310 feet	240 x 280 feet
Amount of Cuts	1600 cu. yds.	1000 cu. yds.
Amount of Fills	4600 cu. yds.	3000 cu. yds.
Maximum Cut Height	10 feet	3 feet
Maximum Fill Height	7 feet	5 feet
Retaining Walls:	none required	none required
Hardware and Equipment – Type and Number:		
115 kV switches	4	4
115 kV line takeoff structures & height	2 @ 50 feet	2 @ 50 feet
115 kV circuit switcher	1	1
Transformer	remove 69/12.5 kV and add	(1) 115/24.9/12.5 kV
69 kV switchrack	remove 69 kV switchrack	none
Circuit breakers	1	1
12.5 kV switchrack	no change	1
Control Building	24 x 36 feet	24 x 36 feet

2.2.2 Nucla Substation

Table A-2.2-2 summarizes the changes required at the Nucla Substation. The Nucla Substation is located at the Nucla Generating Station. Three additional 115 kV switches and a 115 kV gas circuit breaker would be added to the substation facility. No enlargement of the substation pad or fenceline would be required. No grading or other ground disturbances would be associated with these changes.



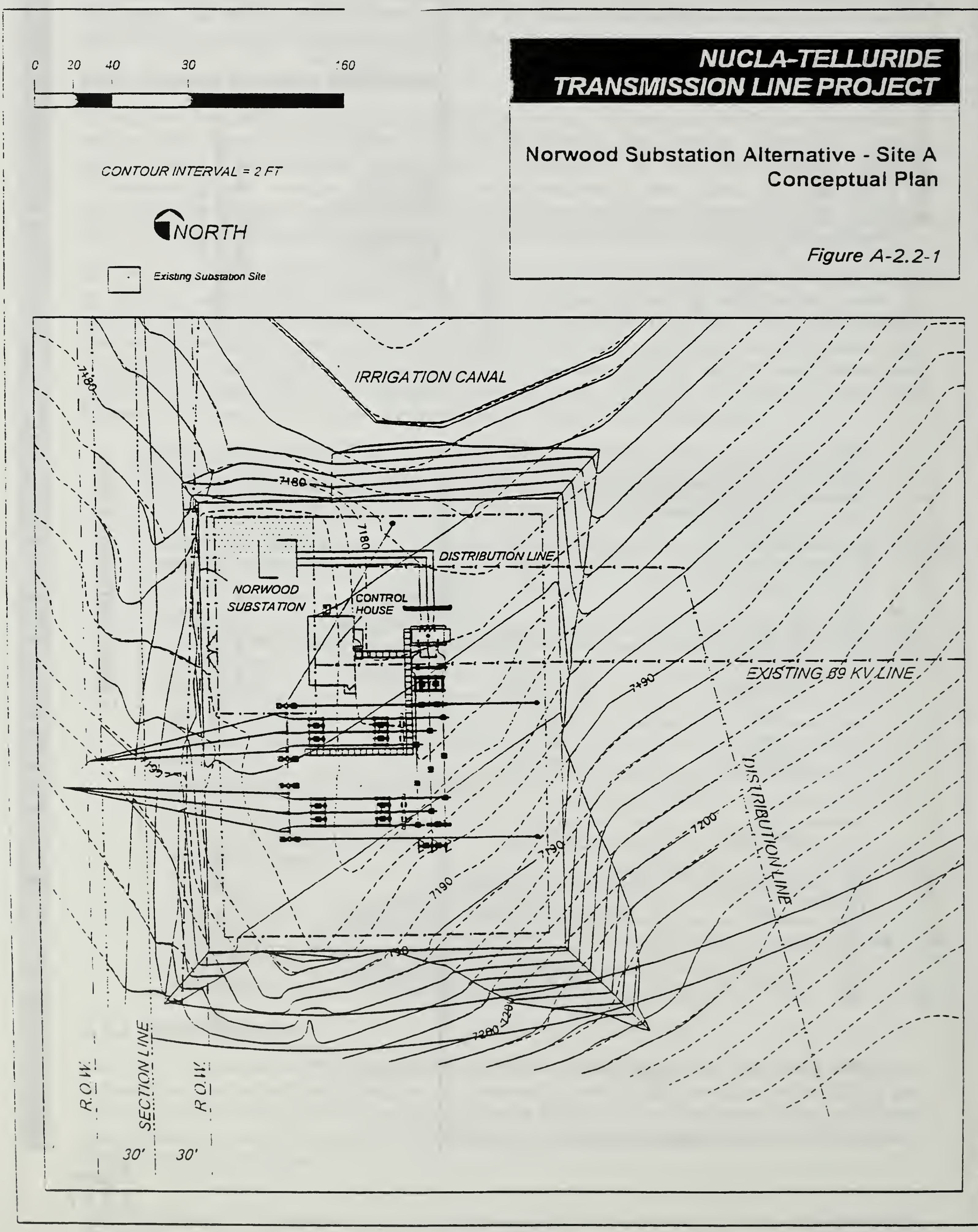
a
Distribution Line
Single Wood Pole - Tangent
(VCIB-2M)

b
Distribution Line
Single Wood Pole - Angle
(VC3-IM)

c
Distribution Line
Single Wood Pole - Deadend
(VC4-ILM)

Typical Distribution Poles

Figure A-2.1-1



NUCLA-TELLURIDE TRANSMISSION LINE PROJECT

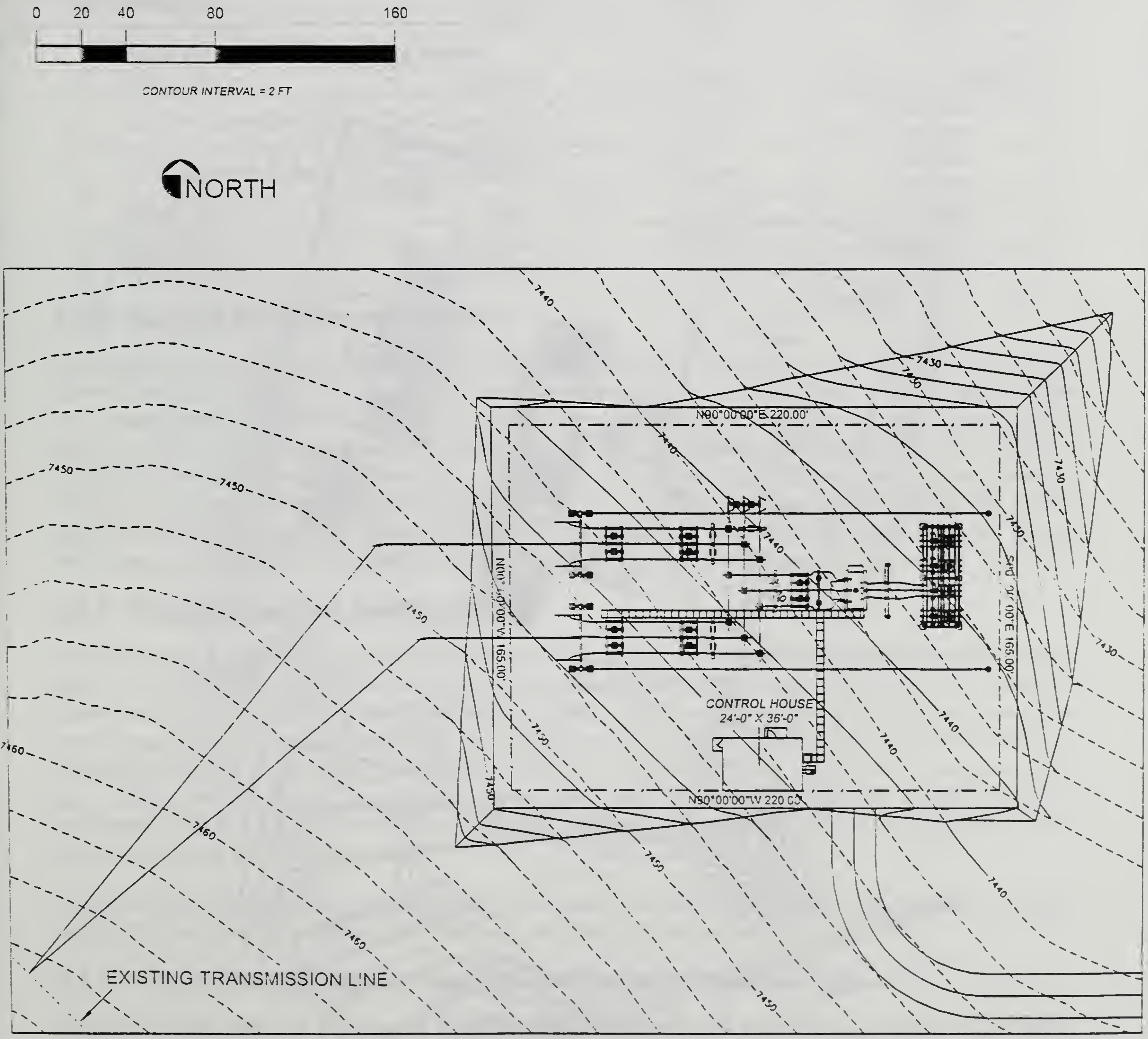
Norwood Substation Alternative - Site A Conceptual Plan

Figure A-2.2-1

NUCLA-TELLURIDE TRANSMISSION LINE PROJECT

Norwood Substation Alternative - Site B Conceptual Plan

Figure A-2.2-2



NUCLA-TELLURIDE TRANSMISSION LINE PROJECT

Sunshine Substation Modifications Conceptual Plan

Figure A-2.2-3

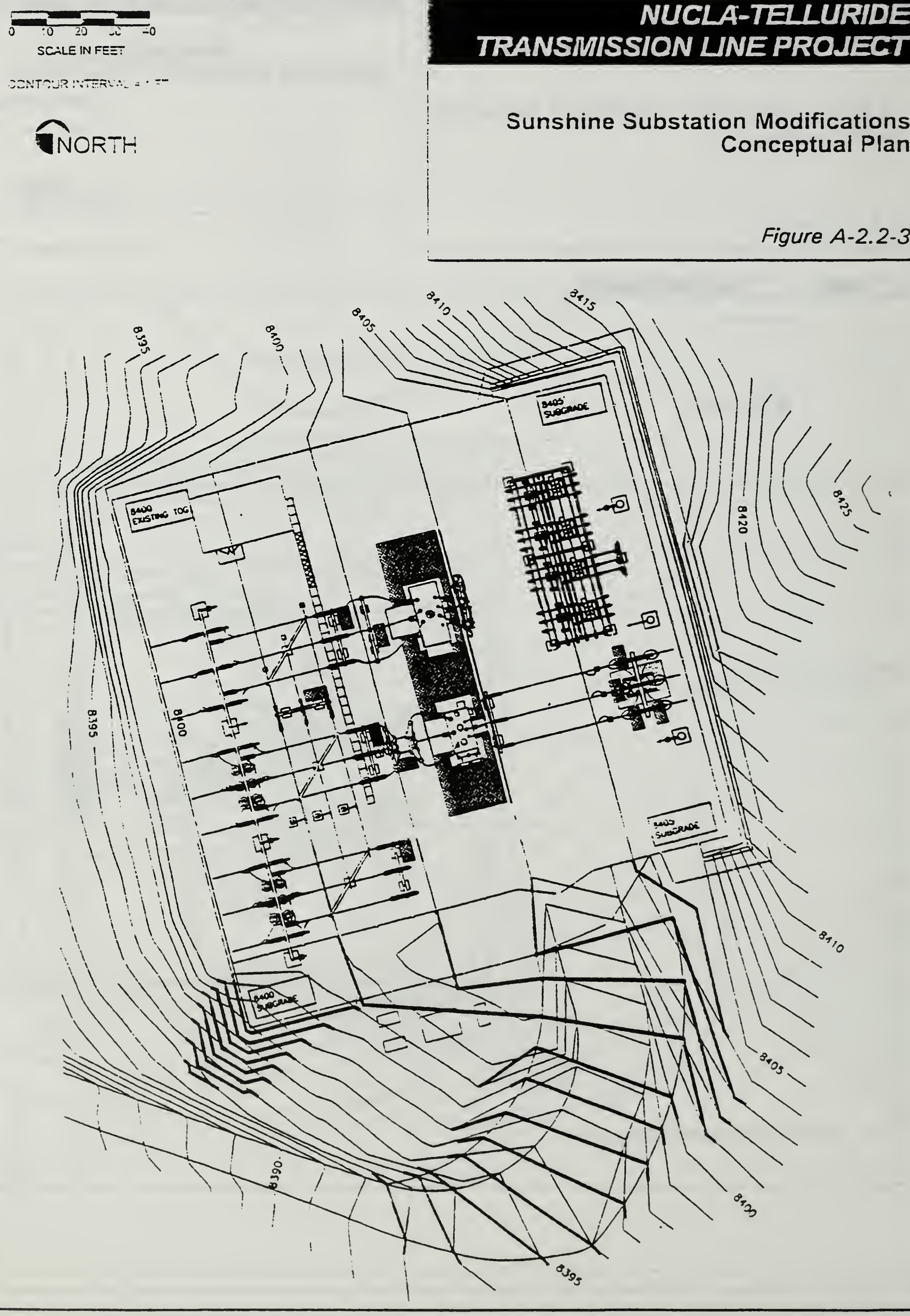


Table A-2.2-2 **Design Characteristics of Nucla, Sunshine and Telluride Substation Modifications**			
CHARACTERISTICS	**Nucla Substation**	**Sunshine Substation**	**Telluride Substation**
Fenceline Dimensions:	no change	additional 18 x 120 feet to the south (0.05 acre)	additional 10 x 105 feet to the north (0.02 acre)
Substation Pad Elevations:	no change	8400 feet amsl	no change
Cuts and Fills:	not required		not required
Substation Size with Cuts & Fills	N/A	11,600 sq. ft. (0.3 acre)	no change
Amount of Cuts	N/A	20 cu. yds.	N/A
Amount of Fills	N/A	210 cu. yds.	N/A
Maximum Cut Height	N/A	1 foot	N/A
Maximum Fill Height	N/A	3 feet	N/A
Retaining Walls:	not required	no change	no change
Maximum Height	N/A	N/A	N/A
Hardware and Equipment – Type and Number:			
115 kV switches	3 additional	3 additional	2 removals, 7 additional
115 kV line takeoff structures	existing	1 additional	1 relocation, 1 additional
115 kV gas circuit breakers	1 additional	2 additional	1 relocation, 1 additional
Transformers	no change	no change	no change
Distribution	no change	no change	no change
Control Building	no change	no change	no change

2.2.3 Sunshine Substation Modifications

Modifications to the existing Sunshine Substation would be required only if the Project terminates at this facility (*i.e.*, the Norwood-Sunshine Alternative is built). *Table A-2.2-2* summarizes the changes that would be required at the Sunshine Substation. The existing substation would be enlarged to the south (18 feet by 120 feet) to accommodate three additional 115 kV switches, a 115 kV line takeoff structure and 2 additional 115 kV gas circuit breakers. Minor grading would be required. ***Figure A-2.2-3*** shows the site plan for the potential modifications at the Sunshine Substation. The existing capacity of the Sunshine Substation (30 MVA/MW) would not change. The height of the switchracks (50 feet tall) would also remain the same.

2.2.4 Telluride Substation Modifications

Modifications to the existing Telluride Substation would be required only if the Project terminates at this facility (*i.e.*, the Norwood-Telluride Alternative is built). *Table A-2.2-2* summarizes the changes that would be required at this facility. The existing substation fenceline would need to be enlarged slightly. Modifications to existing equipment would include replacement of and increase in the number of 115 kV switches, 115 kV line takeoff structures and gas circuit breaker(s). No grading would be required. The existing capacity of the Telluride Substation (20 MVA/MW) would not change. Similarly, the height of the switchracks would remain the same. *See **Figure A-2.2-4**.*

Tri-State has committed to implementing a number of standard mitigation measures, where applicable and feasible. These measures are outlined in Chapter 2.0, *Table 2.2-4*.

2.2.5 Potential Modifications to Specie and Wilson Mesa Substation Taps

Minor modifications to the Specie Mesa Substation would be required regardless of whether the Norwood-Sunshine or Norwood-Telluride Alternative is built. The existing site would need to be enlarged to be approximately 30 feet by 30 feet, in order to provide sufficient room to rewire and reconnect the transformer for the 115 kV system. A 115 kV rated fuse would also

be added to the site. These same modifications would also be made to the Wilson Mesa Substation, if the Norwood-Sunshine Alternative is built.

2.2.6 Removal of Existing Norwood, Oak Hill and Wilson Mesa Substations

Once the Project was in operation, the Oak Hill Substation would be dismantled. The Wilson Mesa Substation would also be removed if the Norwood-Telluride Alternative is constructed.

2.3 SAN MIGUEL POWER ASSOCIATION'S CONSTRUCTION PRACTICES

2.3.1 Construction of Distribution Lines

Modifications to SMPA's system would vary by alternative, and would potentially include changes to overhead lines, construction of new overhead and/or underground lines, and changes to existing underground lines. Construction vehicles and equipment would access construction areas from adjacent roadways. No new access roads would be required for these changes.

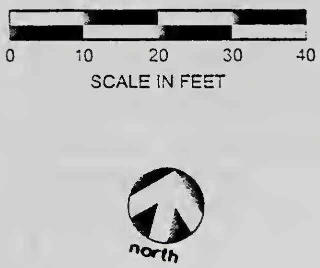
Modifications to Overhead Lines and New Lines. Construction activities required for the overhead distribution system modifications would be similar to the 115 kV line. *Table A-2.3-1* lists the activities, equipment and time frames that would be associated with changing approximately 8 miles of overhead line. Actual time frames would vary by alternative, but would not be expected to exceed this estimate. Most changes to SMPA's overhead system would require 4 to 6 weeks to complete.

Table A-2.3-1
Personnel and Equipment for Construction of Overhead Distribution Lines

Activity	Crew Size	Equipment	Length of Time*
Surveying and Staking	3-person crews	1 utility vehicle	2 weeks
Materials Handling at Equipment Staging Areas	2-3 people per truck	1 pickup truck 1 utility vehicle 1 pole delivery truck	2 weeks
Pole Hole Digging and Guy Anchor Installation	4-6 people	1 rotary drilling rig 1 backhoe 1 utility vehicle	4 weeks
Pole Framing and Setting and Transformer Installation	4-6 people	1 boom truck 1 bucket truck, 1 reel trailer 1 utility vehicle	4 weeks
Wire Stringing, Tensioning and Clipping	6 people	1 puller/tensioner trailers 1 boom truck 1 bucket truck 2 utility vehicles	4 weeks
Post-Construction Cleanup	4 people	1 dump truck 1 utility vehicle	2 weeks
Restoration/Revegetation	2-3 people	1 utility vehicle 1 backhoe	1 week

**NOTE: Durations based on 8 miles of 3-phase overhead distribution line construction.*

Modifications and New Underground Lines. Underground construction methods would be used where required by San Miguel County regulations on private lands and where agencies require on federal lands. *Table A-2.3-2* lists the activities, equipment and time frames that would be associated with changing approximately 2.0 miles of underground line. Actual time frames would vary by alternative, but would not be expected to exceed this estimate. Most changes to SMPA's overhead system would require two to four months to complete.



NUCLA-TELLURIDE TRANSMISSION LINE PROJECT

Telluride Substation Modifications Conceptual Plan

Figure A-2.2-4

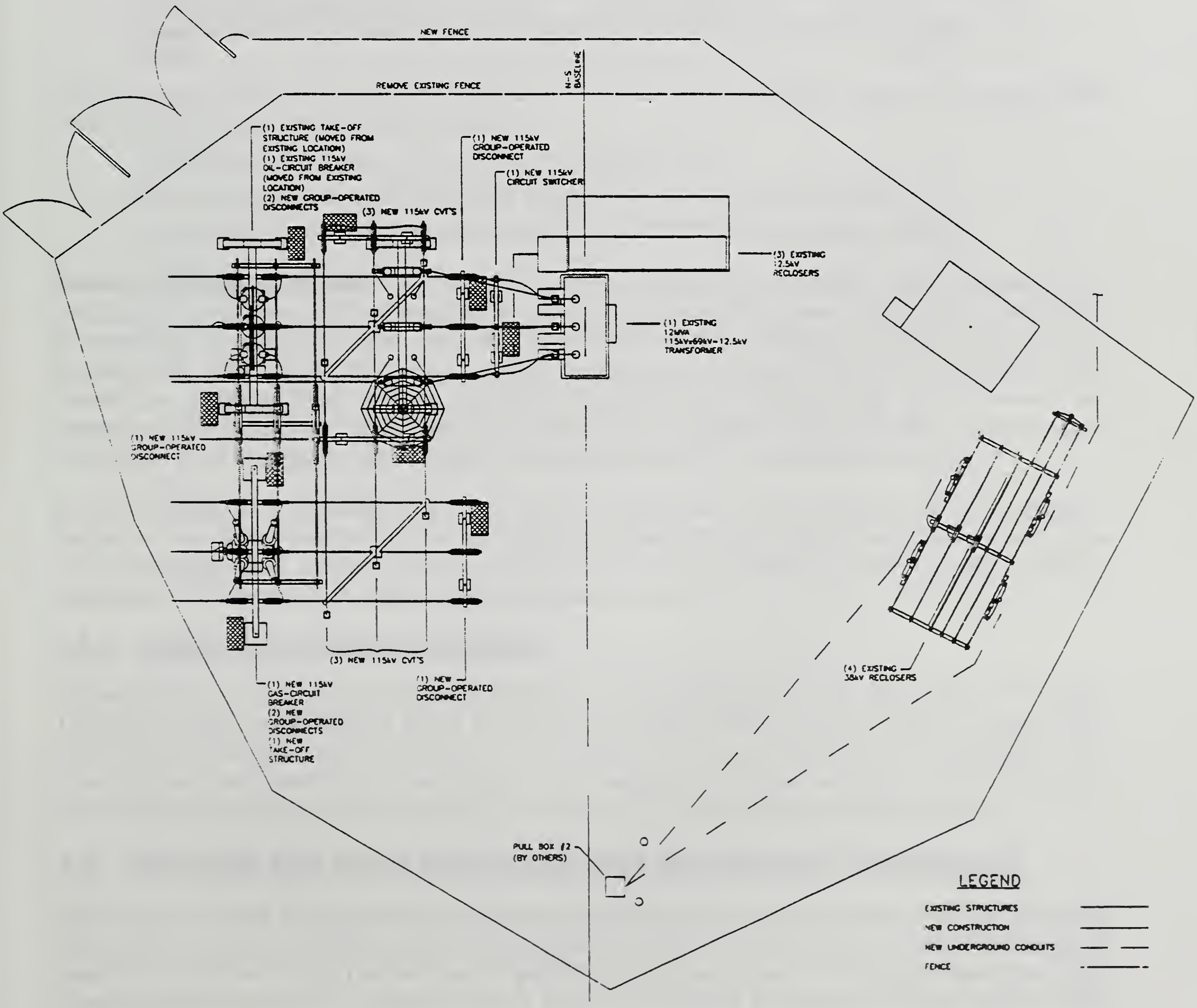


Table A-2.3-2 **Personnel and Equipment Required for Conventional Construction of Underground Distribution Lines**			
Activity	**Crew Size**	**Equipment**	**Length of Time***
Surveying, Clearing, and Grading	3 people	2 utility vehicles per crew	1 month
Installation of Vaults, Pads and other Accessories	3-4 people	1 backhoe 1 haul truck 2 utility vehicles	1.5 months
Mainline Trenching and Cable Installation	5-6 people	1 excavator 1 backhoe 2 haul trucks 1 boom truck 1 compactor 2 utility vehicles 1 water truck	2 months
Regrading Roads	2-3 people	2 utility vehicles 1 grader 1 loader 1 dump truck	2 months
Splicing of the Underground Cable	3-4 people	2 utility vehicles	2 months
**Note: Durations based on 2 miles of 3-phase direct buried underground distribution construction along existing roads.*			

Construction of the underground distribution circuits along existing roads and trails would entail the following construction activities:

1. Staking of the route and location of pads and vaults
2. Excavating the trench, installing sand bedding, vaults, and conduit
3. Cable laying, backfilling, and regrading. Cable splicing and terminations

Removal of Existing 69 kV Line. Portions of the existing 69 kV line, including poles, hardware and conductor, would be removed once the Project is operational. In areas where the existing line is accessible by truck, the line crew would disconnect the existing wire and drop it to the ground. The wire would be reeled up and hauled to a salvage facility. A wreck-out crew would use a boom truck to lay down the structure and would strip the crossarm and insulators. All materials would then be hauled off the right-of-way to a utility salvage area. All treated wood products not reusable would be disposed of at a licensed facility.

In areas where the existing 69 kV line is not accessible with conventional equipment, a helicopter would be used to lift the existing structures off the right-of-way to a salvage area for disassembly and disposal. Poles would be cut off at or below ground level, except in cultivated or pasture land where poles would be extracted.

2.3.2 Construction of Substation Facilities

Construction of a new Norwood Substation and modifications to the Nucla, Sunshine, Telluride, Specie and Wilson Mesa Substations would entail several phases. Construction activities are summarized in *Tables A-2.3-3* and *A-2.3-4* and consist of site grading, civil construction, and electrical construction and testing. The final activity at the Norwood Substation site would entail dismantling and removing the existing substation facility.

3.0 TRI-STATE AND SMPA OPERATION AND MAINTENANCE PRACTICES

Tri-State's and SMPA's preventive maintenance program for the substations and transmission line would involve periodic aerial and ground patrols. Substations would be inspected monthly. Tri-State would conduct aerial patrols of the transmission line three times per year. Ground patrols would be conducted once per year. Ground inspections would involve both

vehicle (including ATV's) and foot patrols. Tri-State would use foot patrols in areas where roads either do not exist or are not permitted. Guidelines and specifications on road development, use and maintenance would be detailed in the 'Construction, Operation and Maintenance Plan,' which would be required as part of any Special Use Permit and right-of-way issued by the Forest Service or BLM.

Table A-2.3-3
Personnel and Equipment Required for Construction of New Norwood Substation

Activity	Crew Size	Equipment	Length of Time
Site Grading and Road Construction	2-person survey crew 4-person grading crew	1 Caterpillar 1 loader 1 all-wheel grader 1 roller/compactor 1 water truck transfer dumps for import/export required	3 weeks
Civil Construction Foundations Fence Grounding Steel Buswork Switches	5-person civil crew	various concrete trucks 1 drill rig 1 backhoe 1 10-yard dump truck 1 tool trailer 1 stake bed truck 1 20-ton crane	6 weeks
Control Building Foundation and Steel Building	4 person crew	1 concrete truck 1 backhoe 1 tool trailer 1 10-ton crane	8 weeks
Transformer Installation Hauling Setting Assembly Testing	4-person civil crew 4-person electrical crew 2-person test crew	1 40-foot rigging truck 1 9-axle low bed truck 4 oil tankers 1 vacuum pump trailer 1 oil filter	4 weeks
Electrical Construction and Testing Breakers Installation Electric Panels Control Panel	5-person electrical crew 4-person test crew	1 20-ton crane 1 forklift 1 tool trailer 1 stake bed truck 2 40-foot material delivery trucks 1 test truck/van 1 maintenance vehicle	8 weeks
Clean-up	all crews	1 rollaway dumpster	ongoing
Continuous Equipment	—	office trailer pickup trucks carry all portable generators	ongoing

Maintenance activities may include repairing damaged conductors, inspecting and repairing structures, and replacing damaged and broken insulators. In addition to maintaining the structures, conductors, and right-of-way, Tri-State would maintain any gates installed by Tri-State.

Noxious weeds are known to exist in the Project area. As a stipulation to federal permits, Tri-State would be responsible for weed control within the limits of the right-of-way and other associated areas (*e.g.* roads), which would be fully detailed in a Construction, Operation and Maintenance (CO&M) Plan. Tri-State would selectively trim trees that pose a clearance or safety problem to the operation of the transmission line. This trimming would be done in coordination with the affected landowners or land managers to ensure that it balances the objectives of minimizing the risk of fire, maintaining vegetation screening, meeting electrical clearance requirements and landowner agreements.

Table A-2.3-4
Personnel and Equipment Required for Modifying Nucla, Sunshine and Telluride Substation Facilities

Activity	Crew Size	Equipment	Length of Time
Site Grading	**Nucla Substation:** not required **Sunshine Substation:** 2 person survey crew 4 person grading crew **Telluride Substation:** not required	**Sunshine Substation:** 1 Caterpillar 1 loader 1 all-wheel grader 1 compactor 2 dump trucks for import/export required	**Sunshine Substation:** 2 weeks
Civil Construction Foundation Grounding Buswork Switches	**Nucla Substation:** 4 person crew **Sunshine Substation:** 5 person crew **Telluride Substation:** 5 person crew	**Nucla (N), Sunshine (S), Telluride (T) Substations:*** Various concrete trucks 1 drill rig (S,T) 1 backhoe 1 10-yard dump truck 1 tool trailer 1 stake bed truck 1 20-ton crane (S,T) various transfer dumps for rock dust	**Nucla Substation:** 3 weeks **Sunshine or Telluride Substation:** 6 weeks
Electrical Construction and Testing Breaker installation Electrical panel Control panel (S,T)	**Nucla Substation:** 7 person electrical crew 2 person test crew **Sunshine or Telluride Substation:** 5 person electrical crew 4 person test crew	1 20-ton crane 1 forklift 1 tool trailer 1 stake bed truck 1-2 40-foot material delivery trucks 1 test truck/van 1 maintenance vehicle	**Nucla Substation:** 3 weeks **Sunshine or Telluride Substation:** 5 weeks
Cleanup	all substations and crews	1 rollaway dumpster	**Nucla, Sunshine or Telluride Substations:** ongoing
Continuous Equipment	not applicable	**Nucla, Sunshine or Telluride Substations:*** pickup trucks carry all portable generators (S,T)	**Nucla, Sunshine or Telluride Substations:** ongoing

**NOTE: Equipment would be required at each substation, unless indicated otherwise. Equipment required at only some substation sites are noted by the pertinent substation initial.*

3.1 EMERGENCY AND PROJECT ACCIDENT CONTINGENCY PLANS

Tri-State has procedures in place to address the potential for accidents, emergency repair and response needs during the Project construction and operation phases. During construction Tri-State and the contractors building the Project would have safety plans that provide for injury/accident response on the job site in accordance with OSHA regulations. Tri-State on-site personnel would have mobile radio and cell phone communications with the contractor and Tri-State headquarters. Construction personnel would be able to contact local fire and rescue organizations through cell phone in the event of an emergency.

The substations would be designed to meet the requirements of Oil Pollution Regulations. SMPA would implement a Spill Prevention, Control and Countermeasures Plan based on an

analysis of the probability of contaminated surface or groundwater. Power transformers would be installed with secondary oil containment systems.

During project operation, protection equipment within the substations would monitor the operating condition of the electrical system and would rapidly de-energize the line or substation equipment if a fault or other problem is detected. The nature of the problem would be relayed to Tri-State's and/or DMEA's System Control Center via the utility's independent communication system. The system operator would diagnose the problem and restore service using remote operation of switches and circuit breakers if possible. Maintenance personnel would be dispatched to the site, if necessary.

Assuming the new system operates as designed, a line fault between Nucla and Telluride would not cause an interruption of service in Telluride, since there would be an additional circuit breaker located at the Telluride Substation. However, this same fault would cause an interruption of about three to five minutes at Norwood while the system operators remotely open switches and close circuit breakers at Telluride or Nucla to restore service at Norwood Substation. A permanent fault between Norwood and Telluride would cause a longer interruption of service to Specie and Wilson Mesa. Tri-State and/or SMPA would need to locate the fault between Norwood and Telluride and if it could not be quickly remedied, the linemen would disconnect the conductor jumpers at a dead end structure causing an open circuit and isolating the source of the fault (*i.e.*, damaged line, fallen tree, etc.). The line could then be energized from either Telluride or Norwood thereby restoring service to Specie and Wilson Mesas. This would be the same response as today with the existing system between Norwood and Telluride.

If the new line was significantly damaged, the repairs could take from one day to several weeks depending on location and weather conditions. During this period, the service to Telluride, Norwood and the mesas would be on a 'single contingency'. That is to say, any additional fault could cause an interruption to service. The duration of the interruption would depend on the source of the fault. It could vary from a couple of seconds to several minutes to even days, not unlike the present situation. The difference being that with a 115 kV looped service, the likelihood of a single contingency interruption occurring is minimized instead of being a regular occurrence.

4.0 PROJECT SCHEDULE AND COSTS

The Project construction schedule is shown in *Table A-4-1*. Costs for the various alternatives are summarized in *Table A-4-2*.

Table A-4-1
Nucla-Telluride Transmission Line Project Construction Schedule

Construction Activities	No. of Persons	2003 and 2004																
		Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
115kV Transmission Line																		
Surveying and Staking	9 people																	
Access Development	5-10 people																	
Clearing	4-6 people																	
Material Staging	6 people																	
Excavation	9 people																	
Structure Assembly	8 people																	
Wire Stringing	16-21 people																	
Clean Up and Restoration	12 people																	
Substation Modifications																		
Nucla Substation																		
Civil Construction	4 people																	
Electrical Construction	9 people																	
Norwood Substation																		
Site Grading	6 people																	
Civil Construction	5 people																	
Control Building Construction	4 people																	
Electrical Construction	10 people																	
Transformer Installation	9 people																	
Sunshine Substation																		
Site Grading	8 people																	
Civil Construction	5 people																	
Electrical Construction	9 people																	
Telluride Substation																		
Civil Construction	5 people																	
Electrical Construction	9 people																	
Distribution System Modifications																		
Construction of Overhead Lines	6-8 people																	
Construction of Underground Lines	8-10 people																	

Table A-4-2
Costs of Primary Alternatives by Facility Improvements

	ALTERNATIVES					
	Nucla-Norwood Northern Alternative with Norwood-Sunshine Alternative	Nucla-Norwood Central Alternative with Norwood-Sunshine Alternative	Nucla-Norwood Southern Alternative with Norwood-Sunshine Alternative	Nucla-Norwood Northern Alternative with Norwood-Telluride Alternative	Nucla-Norwood Central Alternative with Norwood-Telluride Alternative	Nucla-Norwood Southern Alternative with Norwood-Telluride Alternative
115kV Transmission Line Costs						
	$2,898,000.00	$3,489,000.00	$3,284,000.00	$2,898,000.00	$3,489,000.00	$3,284,000.00
	6,047,000.00	6,047,000.00	6,047,000.00	6,545,000.00	6,545,000.00	6,545,000.00
Subtotal:	***$8,945,000.00***	***$9,536,000.00***	***$9,331,000.00***	***$9,443,000.00***	***$10,034,000.00***	***$9,829,000.00***
Substation Costs						
Nucla Substation	540,000.00	540,000.00	540,000.00	540,000.00	540,000.00	540,000.00
Norwood Substation (Site A)	1,616,000.00	1,616,000.00	1,616,000.00	1,616,000.00	1,616,000.00	1,616,000.00
Telluride Substation				950,000.00	950,000.00	950,000.00
Sunshine Substation	645,000.00	645,000.00	645,000.00			
Specie Mesa Substation	80,000.00	80,000.00	80,000.00	80,000.00	80,000.00	80,000.00
Wilson Mesa Substation	80,000.00	80,000.00	80,000.00			
Subtotal:	***$2,961,000.00***	***$2,961,000.00***	***$2,961,000.00***	***$3,186,000.00***	***$3,186,000.00***	***$3,186,000.00***
Distribution System Costs						
With Nucla Substation	$70,000.00	$70,000.00	$70,000.00	$70,000.00	$70,000.00	$70,000.00
With Oakhill Substation	$630,000.00	$630,000.00	$630,000.00	$630,000.00	$630,000.00	$630,000.00
With Wilson Mesa Substation	$60,000.00					
Subtotal:	***$760,000.00***	***$700,000.00***	***$700,000.00***	***$700,000.00***	***$700,000.00***	***$700,000.00***
Total Costs of Primary Alternatives	**$12,666,000.00**	**$13,197,000.00**	**$12,992,000.00**	**$13,329,000.00**	**$13,920,000.00**	**$13,715,000.00**

Source: Tri-State, April 8, 1999.

APPENDIX A-2

TRI-STATE'S POLICY NO. 113
UNDERGROUNDING HIGH VOLTAGE TRANSMISSION FACILITIES

TRI-STATE
GENERATION AND TRANSMISSION ASSOCIATION, INC.

Board of Directors Policy

Subject: UNDERGROUND HIGH VOLTAGE TRANSMISSION FACILITIES			Policy No.: 113
Original Issue : 7-7-00	Last Revised:	Last Reviewed: 11-8-00	Page 1 of 1

OBJECTIVE

To set forth the terms and conditions under which Tri-State will consider constructing underground high voltage transmission facilities as an alternative to the construction of overhead high voltage transmission facilities.

ACCOUNTABILITY

The Board of Directors.

SCOPE

Tri-State will consider the construction of underground high voltage transmission facilities when local jurisdictions or land owners agree to advance increased cost of the construction and operation of such facilities. The increased cost of the underground facilities will not be borne by Tri-State, but must be borne by the local jurisdictions or land owners who agree to pay for the same.

Terms and Conditions

1. Once a request to construct underground high voltage transmission facilities has been received, Tri-State will estimate the cost of construction and operation of comparable overhead and underground facilities in order to determine the increased cost of the underground construction and operation. Information as to the amount of the cost of constructing and operating comparable overhead and underground facilities will be furnished to the party(ies) requesting such construction and operation.

2. Tri-State will allow such party(ies) six (6) months for arrangements for financing to be completed. After this period, if such arrangements have not been completed, Tri-State will normally construct the facilities overhead.

3. Tri-State will not construct an underground high voltage transmission facility to serve a radial load (a load with only one source of power), unless provision for a reliable alternative source of power is made and paid for by the party(ies) requesting such construction.

4. Tri-State will not construct an underground high voltage facility which will compromise the reliability of the transmission system. Examples of actions which may compromise the reliability of the transmission system include, but are not limited to, constructing such facilities in or through rough terrain, dangerous river or stream crossings, flood plains, areas with seasonally restricted access, or other uncertain geological conditions.

❖ ◆ ❖

______________________, Chairman and President	Date: 11-8-00

underground

APPENDIX A-3

Tri-State's Policy No. 050

Policy for Purchase of Capacity and Energy from Small Generation Sources Using Renewable Energy Resources

TRI-STATE

GENERATION AND TRANSMISSION ASSOCIATION, INC.

BOARD OF DIRECTORS POLICY

Subject: POLICY FOR PURCHASE OF CAPACITY AND ENERGY FROM SMALL GENERATION SOURCES USING RENEWABLE ENERGY RESOURCES		Policy No. 050
Original Issue Date: 7/8/92	Date of Last Review: 9/2/98	Page 1 of 5

OBJECTIVES

Tri-State is dedicated to assuring an adequate and reliable long-term supply of electricity to its Members at the lowest possible cost, consistent with sound business practices. Accordingly, and as a cooperative dedicated to consumer well-being and the public interest, Tri-State is committed to the conservation of natural resources by offsetting generation produced from non-renewable energy resources with generation produced from renewable energy resources, to the extent that such offset is cost-effective, efficient and practical.

ACCOUNTABILITY

The General Manager.

SCOPE

Tri-State has both the right and the obligation under the regulations implementing the Public Utilities Regulatory Policies Act of 1978 (PURPA) to purchase capacity and energy from Qualifying Facilities, as defined in Section 201 of PURPA. Set forth below are the conditions under which Tri-State shall make interconnection with, purchase from or provide transmission service to Qualifying Facilities of installed capacity of one megawatt or less produced from renewable energy resources ("Small Renewable Facilities").

All such arrangements will be set forth in contracts between Tri-State and the owner(s) of the Small Renewable Facility and, if appropriate, any involved Tri-State Member. Arrangements for facilities larger than one megawatt of installed capacity will be negotiated on a case by case basis. In the event this policy is amended or superseded, contractual arrangements will be based on the policy in effect at the time of a written request to Tri-State for initiation of contract negotiation.

IMPLEMENTATION

1) *Interconnection*

Tri-State Board of Directors Policy No. G-1, Section 2.m. states, "Tri-State shall contract for all generation resources with greater than 25 kW nameplate capacity at any one site. Tri-State Members shall make purchases from generating facilities with 25 kW or less nameplate capacity which are Qualifying Facilities."

H. T. Thompson, President	Date 9/2/98

Tri-State will cooperate with the developer(s) and/or owner(s) of Small Renewable Facilities in matters concerning interconnection to the Tri-State electric system. Any such interconnection shall be made only after appropriate contracts are executed by all parties involved. Such developer(s) or owner(s) should contact the appropriate Member(s) of Tri-State for basic information regarding interconnection. Detailed interconnection studies and contractual development will generally involve both Tri-State and the Member(s).

Each Small Renewable Facility must meet the interconnection requirements of each Tri-State Member with which the Small Renewable Facility may interconnect as well as those of Tri-State, as set forth in Tri-State's Interconnection Standards For Qualifying Facilities ("Interconnection Standards"). These "Interconnection Standards" set forth the details of Tri-State's requirements concerning protective equipment, inspection and maintenance, insurance, metering, liability, and the procedure to be followed during application for interconnection.

2) *Cost Responsibility*

Any costs incurred by Tri-State in connection with an interconnection request shall be the sole responsibility of the owner(s) of the Small Renewable Facility making such request, including, but not limited to, contracting, engineering, and testing activities, and any required construction or modification of distribution or transmission system facilities or of any metering or telecommunication facilities.

3) *Transmission Service*

If the owner(s) of a Small Renewable Facility elect to sell capacity and energy produced by such Facility to a third party, Tri-State will provide transmission service as set forth in the Interconnection Standards. The amount of capacity and energy transmitted by Tri-State for the account of another utility is subject to the capability of the Tri-State electric system to accept and deliver such capacity and energy, as determined solely by Tri-State.

4) *Purchase Price For Capacity And Energy*

The amount of capacity and energy purchased by Tri-State is subject to the capability of the Tri-State electric system to accept and deliver such capacity and energy, as determined solely by Tri-State.

____________________, President	Date 9/2/98

Total capacity and energy deliveries to Tri-State from each Small Renewable Facility must maintain a twelve month weighted average monthly load factor at least equal to Tri-State's system-wide three year weighted average monthly load factor for the most recent three year period, hereinafter referred to as the "Rolling Three Year Average Monthly Load Factor," which is currently approximately seventy-one percent (71%). If said load factor is not maintained, an adjustment to the purchase price paid by Tri-State shall be made as described below or the contract with the owner(s) of such Small Renewable Facility may be terminated at Tri-State's option.

Tri-State shall make monthly payments for capacity and energy based on actual metered quantities. The monthly payments shall consist of a capacity charge applied to the metered capacity delivered by the Small Renewable Facility during the half-hour interval during which Tri-State had its member system peak demand during the billing period, and an energy charge applied to the total metered energy delivered by the Small Renewable Facility during the billing period. If the Small Renewable Facility is off-line, or not producing power for any reason during the time of the member system peak demand, the metered capacity for the billing period will be determined by taking an average of the daily metered peak capacity produced for all days during the billing period in which the Small Renewable Facility is on-line for the entire twenty-four hours.

Tri-State reserves the right to calculate the capacity payment based on capacity calculated by dividing total kilowatthours by hours in a billing period. This right could be exercised, for example, at certain small capacity generators not having time of day metering or in the event of meter failure at the time of member system peak demand.

Capacity and associated energy shall be purchased at a rate which is based on Tri-State's Class A Member Composite Rate to its Members, as duly approved by Tri-State's Board of Directors and the Rural Utilities Service, as follows:

A) Energy shall be priced at the average production cost per kilowatthour associated with Unit #3 of Tri-State's Craig Station for the preceding calendar year. The total production cost shall be determined by subtracting the Craig Unit #3 lease cost (item 10a) from the total operation expense (item 12a) as shown in REA Form 12d. The average production cost will be determined by dividing the total net kilowatthours (item 8c multiplied by 1,000) into the total production cost.

H. Thompson, President	Date 9/2/98

B) Capacity shall be priced as calculated annually from the following formula and shall be expressed in dollars per kilowatt per month, and when calculated in conjunction with the energy rate shall yield a composite purchase rate equivalent to a percentage, depending on the value of the adjustment ("Adj.") in the formula below, of Tri-State's Class A Composite Rate to its Members when calculated at the Rolling Three Year Average Monthly Load Factor:

Capacity Rate = [(A x Adj.) - E] x [(L.F. x 730)/1000]

Where:

A	=	Tri-State's Class A Composite Rate to its Members.
Adj.	=	85% from day one through year ten, 75% year eleven through twenty, and 70% thereafter.
E	=	Energy rate as calculated above.
L.F.	=	Rolling Three Year Average Monthly Load Factor

In lieu of said annual calculation, the owner(s) of a Small Renewable Facility may make a one-time election to fix the capacity rate at the initial level for the term of the contract.

If capacity and energy deliveries from a Small Renewable Facility to Tri-State for any billing month yield a twelve month weighted average load factor of less than the Rolling Three Year Average Monthly Load Factor, a billing adjustment will be performed to prorate the capacity revenue paid the Small Renewable Facility. A proration factor will be determined by multiplying the capacity revenue paid by Tri-State by a fraction, the numerator of which is the actual twelve month weighted average load factor and the denominator of which is the Rolling Three Year Average Monthly Load Factor.

The weighted averages are calculated as follows:

$$\text{Weighted Average} = \frac{LF_{(1)} \times KW_{(1)} + LF_{(2)} \times KW_{(2)} + \ldots + LF_{(n)} \times KW_{(n)}}{KW_{(1)} + KW_{(2)} + \ldots + KW_{(n)}}$$

H. Thompson, President	Date 9/2/98

Where: $LF_{(m)}$ is the load factor for month m

$KW_{(m)}$ is the Tri-State Member peak kW demand for month m

n = 36 months for Tri-State

n = 12 months for producer

The purpose of the preceding billing adjustment is to reduce the capacity revenue received by the Small Renewable Facility in the event deliveries to Tri-State do not meet the Rolling Three Year Average Monthly Load Factor. Annual deliveries to Tri-State resulting in a twelve month weighted average load factor exceeding the Rolling Three Year Average Monthly Load Factor will not result in calculations to increase the capacity revenue received by the Small Renewable Facility.

For purposes of the above calculations for billing adjustments, the actual twelve month weighted average load factor of Small Renewable Facilities which generate only seasonally shall be calculated using only those months such facility is scheduled to generate.

◆ ◆ ◆

H J Thompson, President	Date 9/2/98

APPENDIX A-4

Tri-State's Standard Easement Agreement

EASEMENT

Project: ______________________

KNOW ALL MEN BY THESE PRESENTS:

1. That the undersigned ____ ____________________________ (hereinafter called Grantors), in consideration of the sum of Ten Dollars ($10.00) and of the further agreements, compensation and considerations herein stated, receipt of which is hereby acknowledged, does hereby grant to TRI-STATE GENERATION AND TRANSMISSION ASSOCIATION, INC., of Adams County, Colorado (hereinafter called Grantee) and to its agents, successors and assigns, an easement and right-of-way for the erection, construction, reconstruction, replacement, modifications, uprating, upgrading, removal, maintenance and operation of electrical transmission lines and telecommunication lines, including but not limited to fiber optic cables, consisting of structures, poles, towers, wires, cables, footings, foundations, cross-arms and other equipment and fixtures, supporting one or more electrical circuits, and facilities, equipment and systems used or useable for the transmission or provision of telecommunications and fiber optic services (including the transmission of voice, video and data signals), with right to alter, repair, maintain, upgrade, permit the attachment of wires of others, and remove the same in whole or in part at any time, on, over, under and across the easement and right-of-way which is situated in ______________County, in the State of ____ ________________and described on the attached Exhibit A. The lines can be used by Grantee or other persons or entities.

2. That Grantee shall also have the right of ingress and egress across Grantors' property for any purpose necessary in connection with the erection, construction, reconstruction, replacement, upgrade, removal, maintenance and operation of said lines and facilities, and that such right of ingress and egress shall be considered a covenant which runs with the land. Such ingress and egress shall be exercised in a reasonable manner.

3. That Grantors covenant and agree that they are the owners of the above-described lands, and the rights granted herein are subject only to easements of record or in use, as well as outstanding mineral rights of record in third parties. Grantors further covenant that any subsequent grantees who are granted any interest in the rights-of-way conveyed herein will be required to enter into a joint use and maintenance agreement with Grantee, and that this covenant shall be deemed to run with the land.

4. That Grantee shall also have the right at any time to cut, remove, clear away, trim and control, by chemical means, machinery or otherwise, any and all trees, brush and shrubbery whether on the rights-of-way described herein, or adjacent thereto, which now or hereafter, in the sole and exclusive opinion of Grantee, may interfere with the safe construction, operation and maintenance of the lines and facilities, and the equipment used in connection therewith.

5. That Grantee shall also have the right to install, maintain and use gates in all fences which now or might hereafter cross or be adjacent to the rights-of-way conveyed herein.

6. That Grantee shall at all times exercise due care and diligence to avoid damage to the fences, crops, livestock and other personal property on said real property and shall repair or pay the undersigned for any and all damage to said fences, crops, livestock and other personal property caused by Grantee's agents or employees while performing construction or maintenance work on said rights-of-way.

7. The Grantors shall have the right to cultivate, graze, use, occupy and have access to and across the easement area described herein for any purposes which will not constitute a hazard to life or limb, or interfere with any of the rights and privileges herein granted to the Grantee. Unless written permission is granted by Grantee, Grantors shall not erect or construct any building or other structure (including mobile homes or travel trailers), or store flammable or explosive materials or stack hay or straw, or conduct fueling operations, or construct, install or operate above ground mechanical irrigation facilities which could make an electrical contact with the conductors, or drill wells or conduct mining operations, or appreciably alter the grade of the ground surface, within the right-of-way. Upon receipt of written notice from Grantee identifying material or property deemed by Grantee to interfere with the safe operation or maintenance of the lines and facilities, Grantors, their successors, heirs or assigns shall remove the material or property within 10 days. If there is a failure to so remove the material within 10 days, Grantee, its agents, successors or assigns shall have the right to remove the material or property and collect the costs of such removal from Grantors, their successors, heirs or assigns.

8. That Grantors, their successors, heirs or assigns, agree that all structures, poles, wires and other facilities installed on the above-described lands at the Grantee's expense, shall remain the property of the Grantee, removable at the sole discretion of the Grantee; provided, however, that any fences, gates, culverts or ditches constructed by Grantee may be conveyed to Grantors on such terms and conditions and at such times as may be mutually agreed upon by Grantors and Grantee.

9. In the event the lines and facilities are removed and the right-of-way is permanently abandoned, this Easement shall be terminated by a release of easement from Grantee, its successors and assigns, to Grantors, their successors, heirs or assigns. None-use or a limited use of this Easement shall not prevent Grantee from thereafter making use of this Easement to the full extent herein authorized.

10. The telecommunication facilities constructed hereunder may be assigned or otherwise conveyed, in whole or in part, and the terms and conditions herein shall be binding upon the successors, assignees, licensees and representatives of the parties hereto.

11. The provisions of this Easement shall be binding upon and shall inure to the benefit of the heirs, executors, administrators, personal representatives, successors and assigns of the parties hereto.

IN WITNESS WHEREOF, the undersigned has set his/her/its hands on this ______ day of ________________________, 2000.

GRANTORS:

____

ACKNOWLEDGMENT

STATE OF______________)
)ss:
COUNTY OF _____________)

The foregoing instrument was acknowledged before me this _______ day of ___________ ______________________, 2000, by ____ _, in the County of ___________________, State of ___________________________.

IN WITNESS WHEREOF I have heretofore set my hand and official seal the day and year last above written.

(Notarial Seal)

My commission expires: ____
Notary Public

APPENDIX A-5

Nucla-Telluride Transmission Line Project
Underground Cable Systems

Prepared by:

Power Engineers
3940 Glenbrook Drive
Hailey, ID 83333

September 2001

Appendix A-5

Nucla-Telluride Transmission Line Project Underground Cable Systems

Submitted by:

Power Engineers

for the

Nucla-Telluride Project

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CONSTRUCTION AND INSTALLATION

GENERAL CONSIDERATIONS

The basic sequences of construction and installation activities are the same for all underground transmission cable system projects. They include route surveying; soils evaluation; excavation; cable, pipe or duct installation; backfilling and surface restoration; and cable, splice, termination and auxiliary equipment installation and testing and commissioning.

Once the cable route has been determined, the construction and installation activities begin with a detailed survey of the route. The survey establishes route length, changes of direction and the location of existing utilities and other obstructions. A soils evaluation is done to assess soil conditions along the route. This information is useful in evaluating alternative cable systems; excavation, shoring and de-watering methods and equipment; and the need for thermal backfill.

Major civil construction and installation activities are discussed below.

EXCAVATION

Excavation is usually the most labor-intensive and expensive civil construction element involved in underground cable installation. A discussion of the more common excavation methods employed for undergrounding transmission lines follows.

- Trenching is the most common form of excavation used for the installation of underground transmission cable systems, including pipe-type, duct, and direct-buried cable systems. Trenches are generally excavated to the required width and depth using backhoes. Wheel, chain or ladder-type trenchers are sometimes used in areas that include few natural or manmade obstacles, and in soils that are free of rock and large boulders.

  Soil conditions, trench dimensions, and other factors may dictate the need for stabilizing trench walls. This is accomplished through the use of shoring, trench boxes, grouting, and slurry and de-watering techniques. The traditional method of shoring trenches uses vertical wood planks or steel sheets supported by horizontal bracing. Sheet piling, installed via vibratory or impact pile drivers, and trench box systems, suitably braced, are also commonly used.

  Once the cable, duct and/or pipe has been placed in the trench and encased in concrete or bedded in thermal or protective sand or select spoil, as required, the trench is backfilled with compacted spoil or imported materials. Any unused spoil is removed from the site and the trench area is resurfaced to pre-excavation conditions.

  Local ordinances may require that all spoil removed from trenches be hauled away and that concrete and/or sand be used for backfill material.

- Horizontal boring or tunneling is used to minimize disturbance of surface improvements such as roads, railroads, canals, and rivers. There are many different techniques and types of equipment being used for horizontal hole excavation, and less costly methods are continually being developed. Common methods for obtaining horizontal holes for installation of cable, pipes or ducts include pipe pushing, horizontal boring and augering, and horizontal tunneling. The accuracy of unguided

boring, augering and pipe pushing equipment is relatively low, and can cause major problems.

After an augured, bored or drilled hole is in place and stabilized to prevent cave-ins, cables, ducts, and/or pipes are installed and the remaining void must be backfilled with thermal sand or other backfill material. Backfilling the hole is expensive. At present, a common method is to blow the backfill material into place using a plastic tube, a difficult and time-consuming process. A backfill material that can be slurried or poured into the hole and then hardens in place would reduce backfilling costs. Additional information on directional drilling can be found at the back of this appendix.

THERMAL BACKFILL

In all buried transmission cable systems, thermal performance is a key concern. The load (MVA) capacity of cable is dependent upon the thermal dissipation properties of the cables themselves and the backfill material. Cable thermal properties are predictable, but the thermal resistivity of soils is soil type and moisture content related. Use of thermal or select backfill will probably be required to obtain required thermal properties.

CABLE SYSTEM INSTALLATION

Direct Buried

Direct buried, single circuit cable systems installed in trenches are the most economical means for undergrounding transmission lines. When more than one cable circuit must be installed in a single trench, excavation costs for the required additional trench width may reduce the cost efficiency of the direct buried option. Trenching for direct burial of cables will result in disruption of traffic and/or surface activities and facilities. Direct buried cables are vulnerable to dig-in related damage after installation.

To improve heat dissipation and provide space for repair activities, direct buried pipes and cables are separated horizontally in the trench; typical spacings are eight to ten inches. Greater separations are typically provided between adjacent cable circuits to provide increased space for repair activities and to reduce the probability of concurrent failures of adjacent circuits. Manholes are generally installed at splice (joint) locations. Cable pulling equipment is not required, as the cables are laid slack.

Materials used as backfill are carefully selected to provide required thermal dissipation properties.

Duct Bank

In lieu of direct burial, cables can be installed in ducts. This is the method that Tri-State has indicated would be used if sections of the Nucla-Telluride Transmission Line were undergrounded. Metal, concrete or plastic ducts are available for use and they are generally encased in concrete. Duct installation of underground cable systems may be economical when many circuits are to be installed in a confined area. Spare ducts are sometimes included to allow future installation of additional cable circuits. The duct system provides supplemental dig-in protection for the cables, minimizes the probability of concurrent failures of adjacent cables or circuits, and minimizes the length of trench open at any one time. The cables are pulled into the ducts after the backfilling operation has been completed.

Cable systems installed in ducts generally have lower heat dissipation effectiveness than direct buried cable systems. This reduced effectiveness is the result of the increase numbers of proximate cables, closer spacing of the ducts and poorer thermal conductivity of the air surrounding the cables as compared to trench spoil or thermal backfill. The spacing between adjacent ducts is typically one and one-half to three inches. The higher thermal conductivity of concrete as compared to trench spoil or select backfill increases the overall thermal effectiveness of concrete encased ducts. The increase is generally not adequate to offset the previously cited factors that decrease effectiveness. Ampacities of cables installed in ducts must be reduced to reflect this lower overall heat dissipation effectiveness. The level of reduction required is related to the number of ducts that contain cables and the MVA loadings and load factors of the cables.

Manholes are installed along the duct line at spacing not exceeding maximum cable pulling lengths. These pulling lengths are limited by maximum permissible cable pulling tensions and maximum sidewall pressures. Maximum reel sizes may limit cable-pulling lengths in some cases. Extra manholes may be required at sharp bends along the duct route. Metallic conduit may be required at bends that do not include manholes to minimize pulling rope cut-in.

When cable faults occur in duct systems, the faulted cable section is pulled out and replaced between adjacent manholes.

At the ends of the underground line, termination poles or structures are used to transition for the underground line to overhead.

TYPICAL CROSS SECTIONAL VIEWS

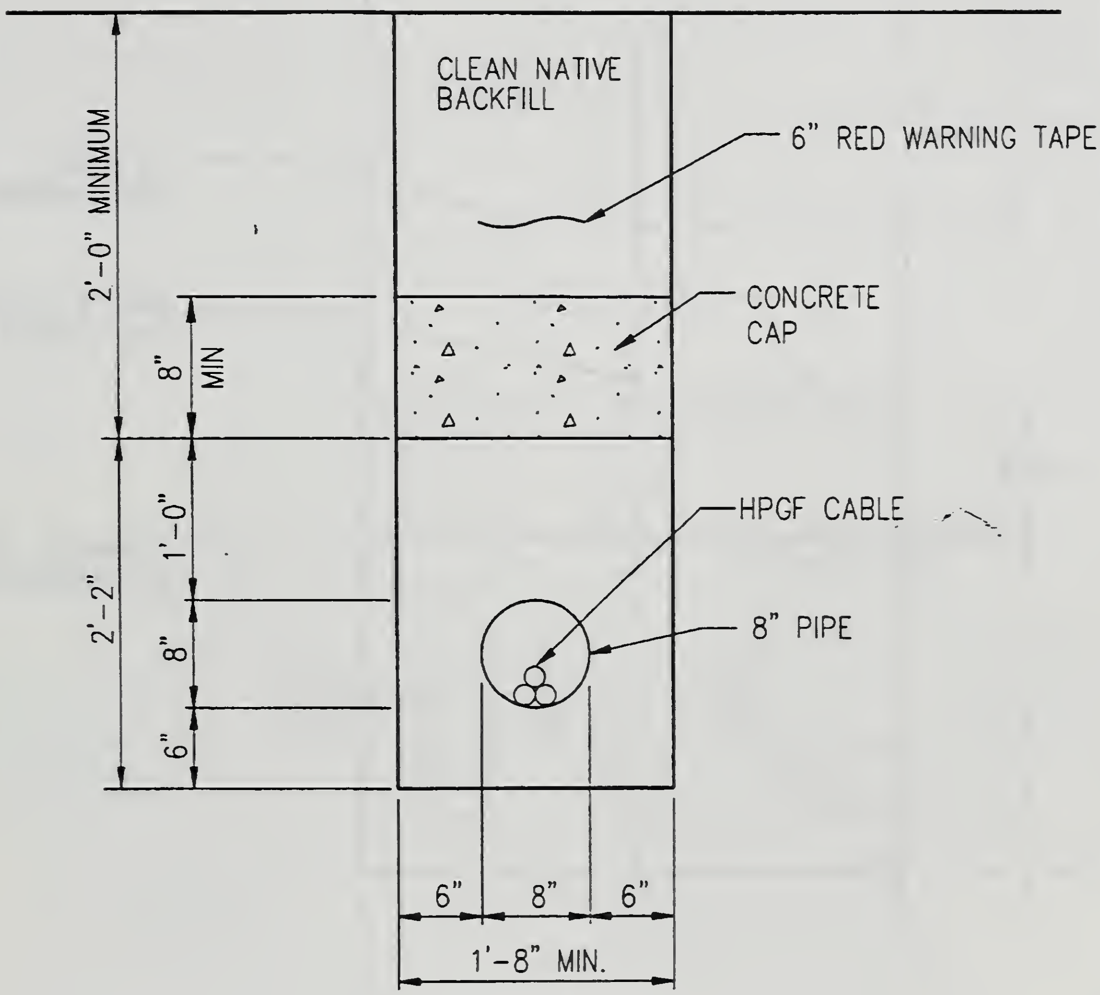
Figures 1 and 2 show cross-sectional views of several typical direct buried cable system installations:

- *Figure 1*: High-Pressure Gas-Filled (HPGF)
- *Figure 2*: Solid Dielectric Cable System (XLPE)

Concrete encased duct installations for HPGF and XLPE are shown in cross-section in *Figures 3 and 4,* respectively. Horizontal directional drilling (HDD) casing installation is shown in *Figure 5*.

Figure 6 shows a cross-sectional view of a cable system right-of-way during construction. The construction corridor would need to be approximately 40 feet wide.

Figure 7 is a schematic of a riser structure that would be installed at transition points between the underground and overhead systems.



TYPICAL TRENCH SECTION

HIGH PRESSURE GAS FILLED CABLE SYSTEM

FIGURE 1

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REV	REVISIONS	DATE	DRN	DSGN	APPD

POWER ENGINEERS
3940 GLENBROOK DRIVE
HAILEY, ID 83333

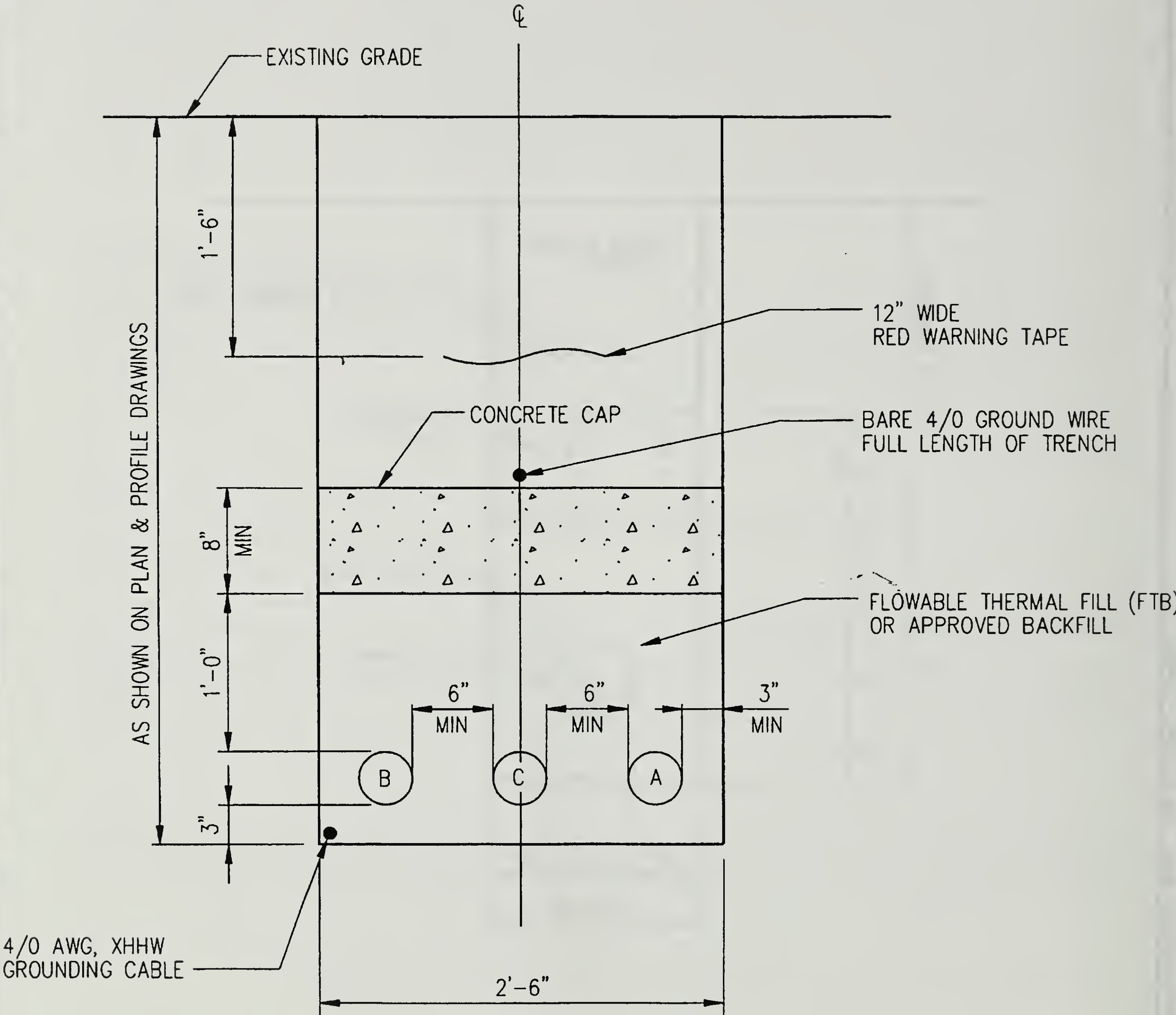
SCALE: SCALE

TRI STATE G&T

NUCLA TELLURIDE TRANSMISSION LINE PROJECT

STANDARD HPGF LAYOUT

dmorford O:\148467\cable2.dwg Model Sep 21, 2001 - 9:40am



TRENCH DETAIL

DIRECT BURIED CABLES AT TERMINALS

FIGURE 2

dmorford O:\148467\direct bury.dwg Model Sep 21, 2001 - 9:42am

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REV	REVISIONS	DATE	DRN	DSGN	APPD

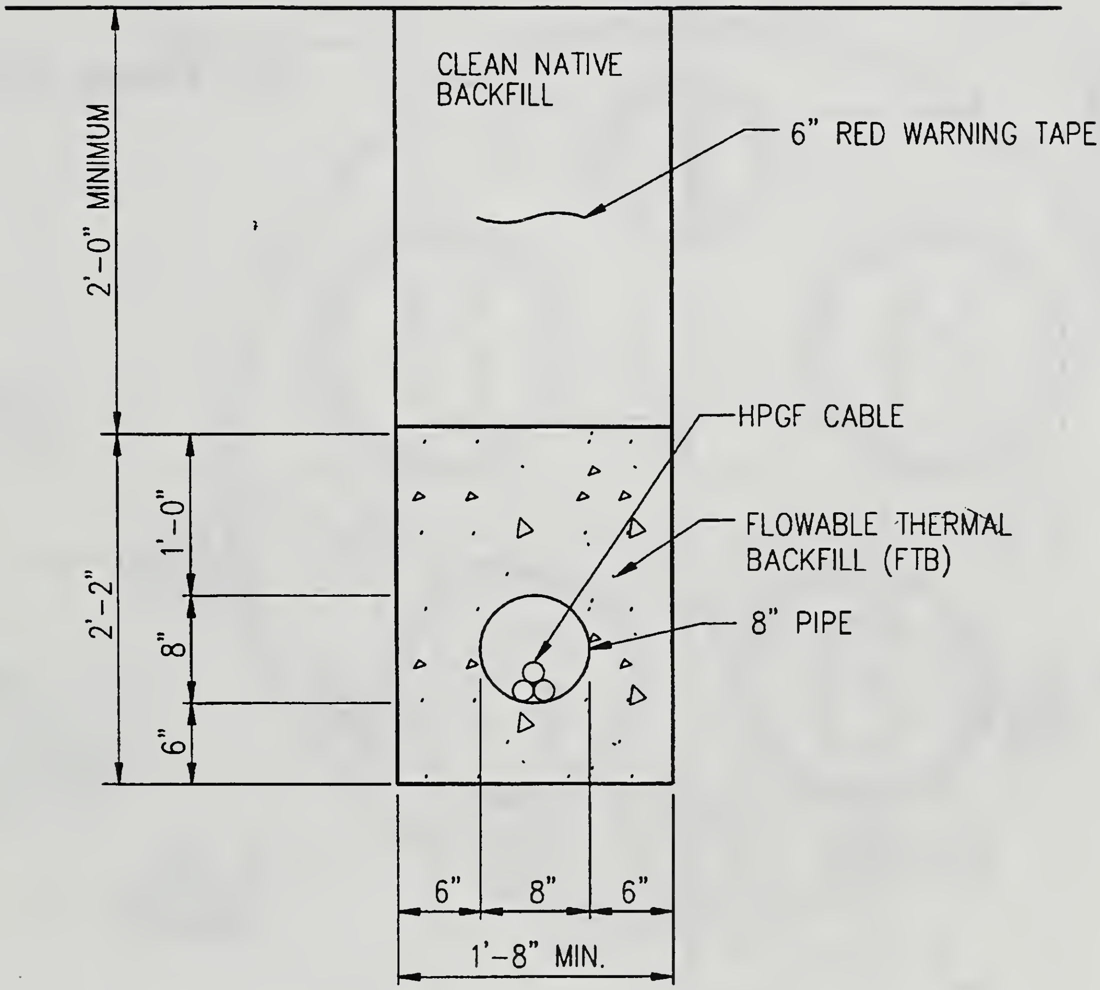
POWER ENGINEERS
3940 GLENBROOK DRIVE
HAILEY, ID 83333

SCALE: SCALE

TRI STATE G&T

NUCLA TELLURIDE
TRANSMISSION LINE PROJECT

TYPICAL DIRECT BURY
LAYOUT



TYPICAL TRENCH SECTION

HIGH PRESSURE GAS FILLED CABLE SYSTEM

FIGURE 3

dmorford O:\148467\cable.dwg Model Sep 21, 2001 - 9:41am

THIS DRAWING WAS PREPARED BY POWER ENGINEERS, INC. FOR A SPECIFIC PROJECT, TAKING INTO CONSIDERATION THE SPECIFIC AND UNIQUE REQUIREMENTS OF THE PROJECT. REUSE OF THIS DRAWING OR ANY INFORMATION CONTAINED IN THIS DRAWING FOR ANY PURPOSE IS PROHIBITED UNLESS WRITTEN PERMISSION FROM BOTH POWER AND POWER'S CLIENT IS GRANTED.

REV	REVISIONS	DATE	DRN	DSGN	APPD

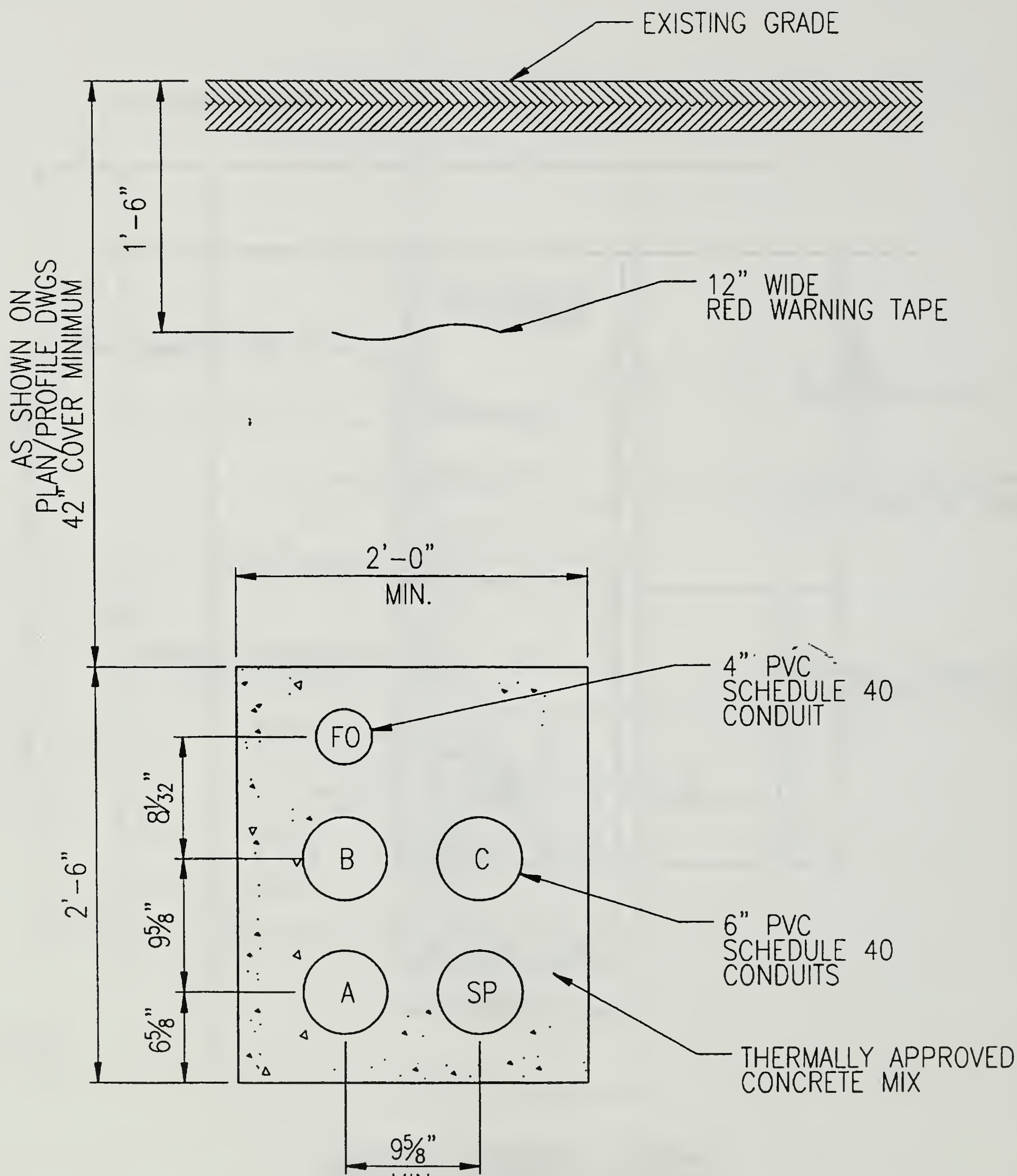
POWER ENGINEERS
3940 GLENBROOK DRIVE
HAILEY, ID 83333

SCALE: SCALE

TRI STATE G&T

NUCLA TELLURIDE TRANSMISSION LINE PROJECT

TYPICAL HPGF LAYOUT



2X2 CONCRETE ENCASED DUCT BANK

DUCT BANK WITH TYPICAL CABLE

FIGURE 4

dmorford O:\148467\duct bank.dwg Model Sep 21, 2001 - 9:43am

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REV	REVISIONS	DATE	DRN	DSGN	APPD

POWER ENGINEERS
3940 GLENBROOK DRIVE
HAILEY, ID 83333

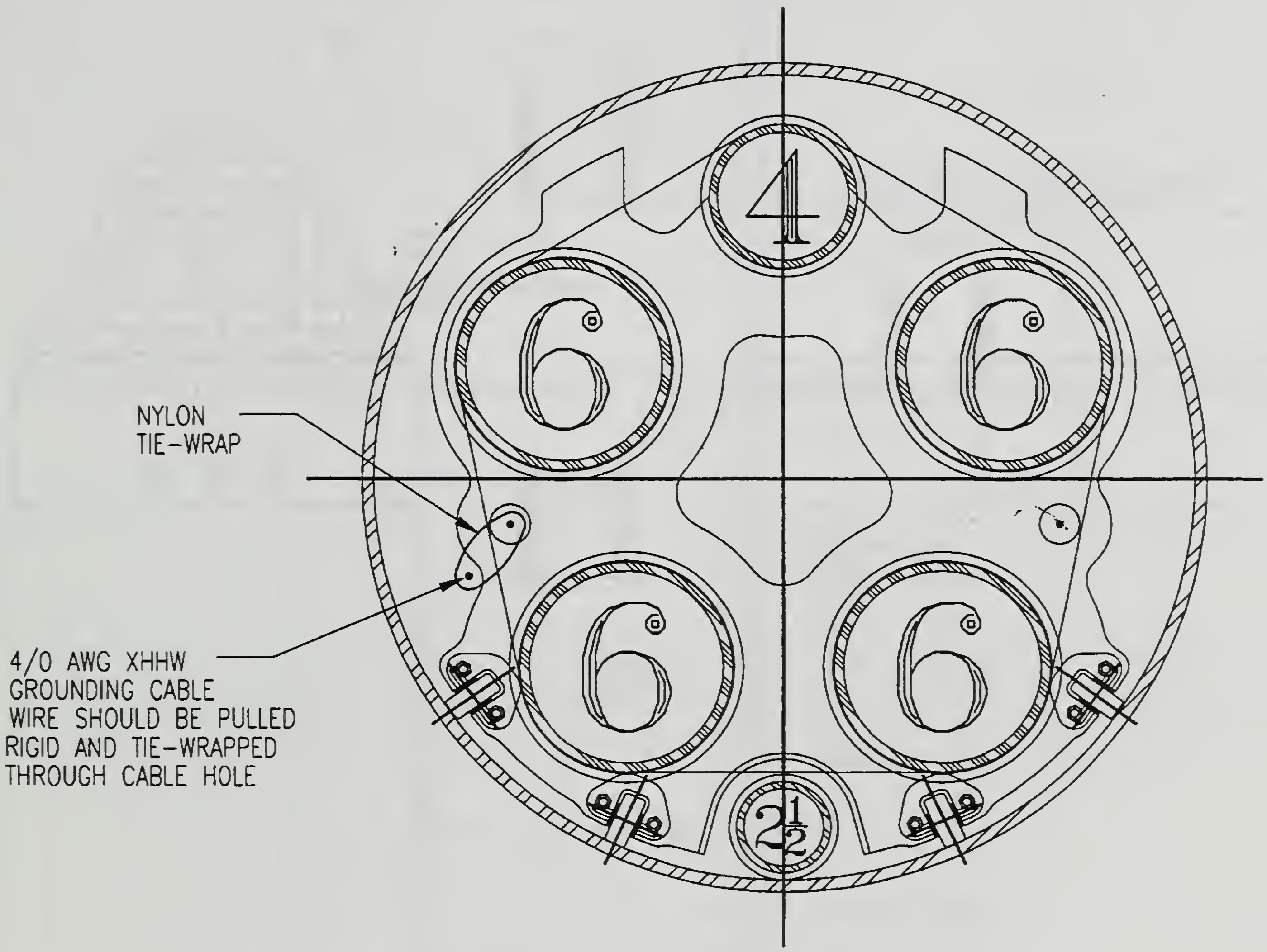
SCALE: SCALE

TRI STATE G&T

NUCLA TELLURIDE
TRANSMISSION LINE PROJECT

TYPICAL DUCT BANK
LAYOUT

dmorford O:\148467\bore spacer.dwg Model Sep 21, 2001 - 9:45am



26"OD X .500 WALL CASING
3.000" BETWEEN CONDUITS

TYPICAL BORE SPACER/CASING

FOR HDD INSTALLATION

FIGURE 5

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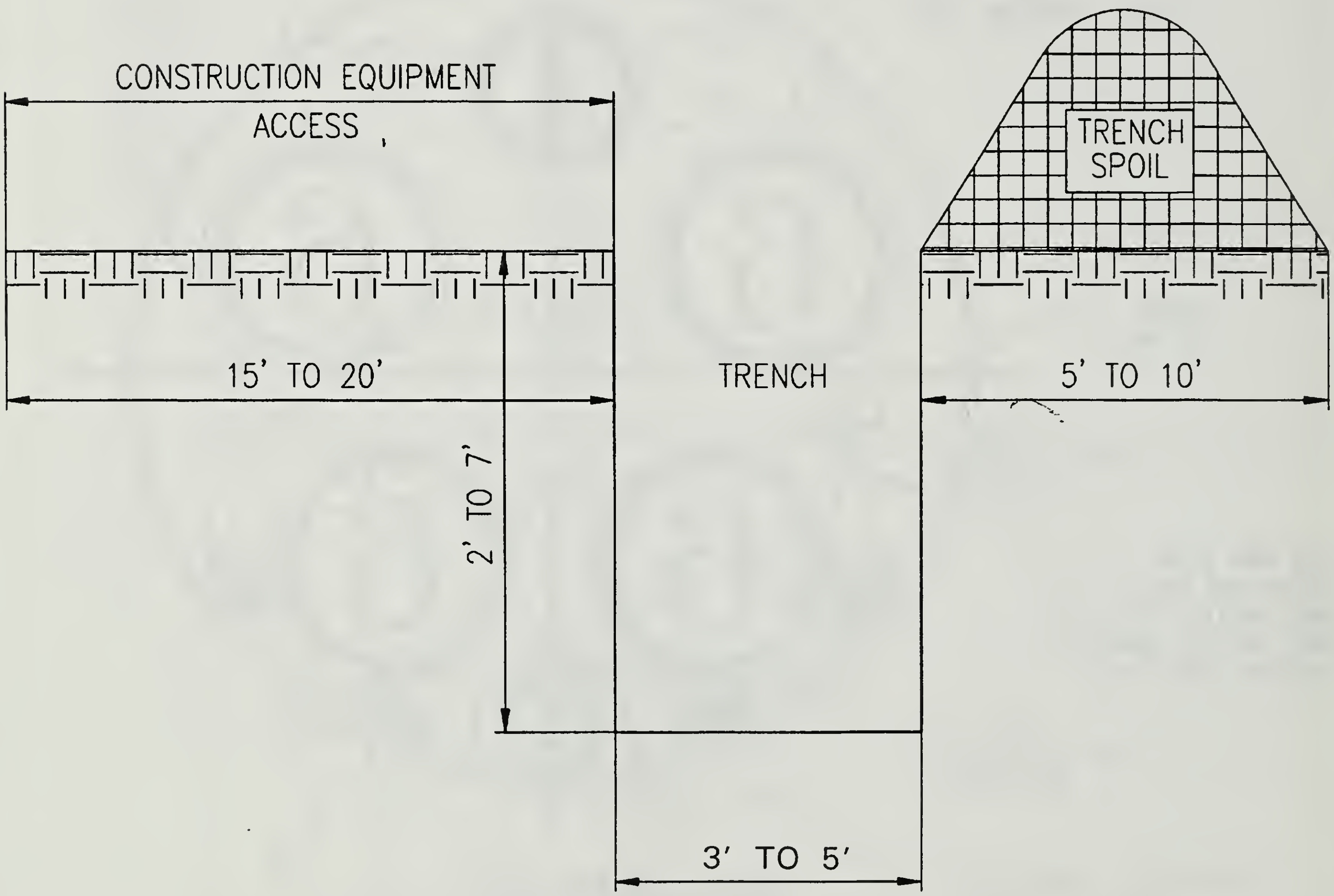
REV	REVISIONS	DATE	DRN	DSGN	APPD

SCALE: SCALE

POWER ENGINEERS
3940 GLENBROOK DRIVE
HAILEY, ID 83333

TRI STATE G&T
NUCLA TELLURIDE TRANSMISSION LINE PROJECT
TYPICAL HDD CASING AND SPACER

dmorford O:\148467\TRENCH.dwg Model Sep 21, 2001 - 10:04am



CROSS SECTIONAL VIEW

CABLE SYSTEM RIGHT-OF-WAY DURING CONSTRUCTION

FIGURE 6

THIS DRAWING WAS PREPARED BY POWER ENGINEERS, INC. FOR A SPECIFIC PROJECT, TAKING INTO CONSIDERATION THE SPECIFIC AND UNIQUE REQUIREMENTS OF THE PROJECT. REUSE OF THIS DRAWING OR ANY INFORMATION CONTAINED IN THIS DRAWING FOR ANY PURPOSE IS PROHIBITED UNLESS WRITTEN PERMISSION FROM BOTH POWER AND POWER'S CLIENT IS GRANTED.

REV	REVISIONS	DATE	DRN	DSGN	APPD

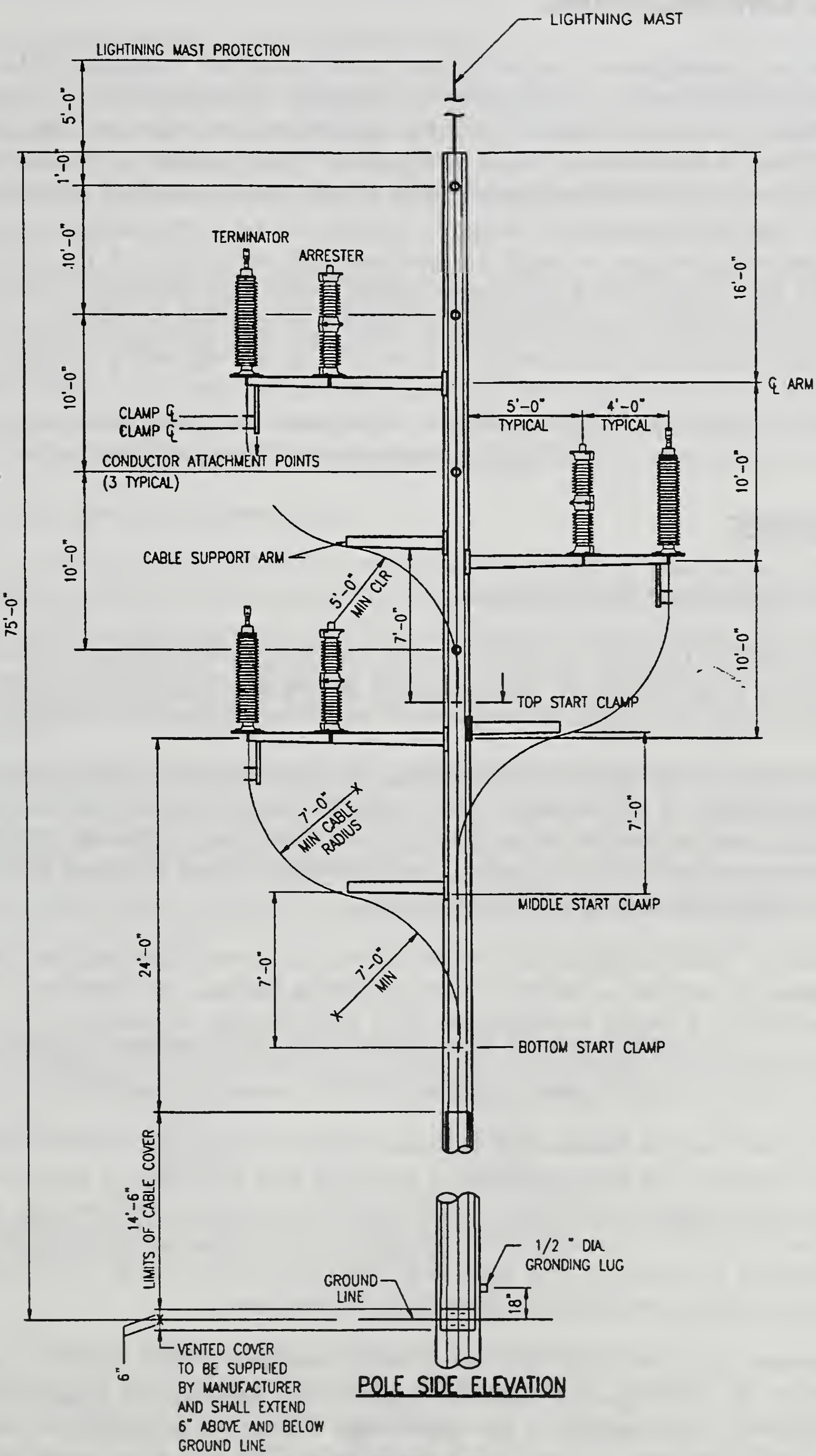
POWER ENGINEERS
3940 GLENBROOK DRIVE
HAILEY, ID 83333

SCALE: SCALE

TRI STATE G&T

NUCLA TELLURIDE TRANSMISSION LINE PROJECT

TYPICAL CROSS SECTION RIGHT-OF-WAY LAYOUT



POLE SIDE ELEVATION

FIGURE 7

THIS DRAWING WAS PREPARED BY POWER ENGINEERS, INC. FOR A SPECIFIC PROJECT, TAKING INTO CONSIDERATION THE SPECIFIC AND UNIQUE REQUIREMENTS OF THE PROJECT. REUSE OF THIS DRAWING OR ANY INFORMATION CONTAINED IN THIS DRAWING FOR ANY PURPOSE IS PROHIBITED UNLESS WRITTEN PERMISSION FROM BOTH POWER AND POWER'S CLIENT IS GRANTED.	REV	REVISIONS	DATE	DRN	DSGN	APPD	POWER ENGINEERS 3940 GLENBROOK DRIVE HAILEY, ID 83333 SCALE: SCALE	TRI STATE G&T NUCLA TELLURIDE TRANSMISSION LINE PROJECT RISER STRUCTURE

dmorford O:\148467\riser.dwg Model Sep 21, 2001 - 9:46am

OPERATION AND MAINTENANCE

GENERAL CONSIDERATIONS

Operation of underground transmission cable systems requires little, if any, operator intervention. The systems are designed to operate automatically with a life expectancy of 30-plus years. Gas-filled cable systems generally include gas monitoring and alarm systems. These systems may require operator intervention to evaluate alarms and the status of the circuits to determine whether or not they should be de-energized. This status evaluation and de-energization decision could also be performed automatically, requiring no operator intervention to evaluate alarms and the status of the circuits to determine whether or not they should be de-energized. With the previously cited exception, post-installation operation and maintenance tasks are essentially maintenance related. These maintenance tasks include inspection, monitoring, testing and preventive maintenance for gas feeding or pumping systems, cathodic protection systems, cables and accessories and replacing or repairing defective cables, accessories or other system components. Typical easements for underground 115 kV transmission cables are 20 feet wide.

MAINTENANCE

- **Solid Dielectric Cable Systems**

  Solid dielectric cable systems do not require gas feeding or pumping systems. As such, the maintenance of these systems is limited to inspection, testing and preventive maintenance, and repair or replacement of cables, splices and terminations.

  Non-destructive tests for evaluating the condition of solid dielectric cable include measurement of dc leakage current, dielectric loss power factor, and ac partial discharge. Two additional tests, absorption current and residual voltage measurements, have been developed in Japan. Unfortunately, none of these tests reliably indicate remaining cable life or cable condition.

  Repair of cable splices and terminations involves locating the faulted component; digging to expose a failed splice, if direct buried, or locating a failed splice in a manhole or a failed termination on a termination structure or in a substation; and repairing or replacing the component as required. Surface improvement restoration may also be required after repair or replacement of a direct buried splice.

  To repair faulted cables, the location of the fault is first determined. If the cable is direct buried, the fault location is exposed and the cable is repaired using a splice(s) and a short piece of cable, if required. For duct installations, the fault need only be located between two adjacent manholes. The failed cable section, between the two manholes, is removed and replaced. The new cable section is then spliced to the ends of the existing, un-faulted cables in both manholes.

  Location of cable faults can be a time-consuming process. No single fault-locating method is capable of pinpointing the exact location of faults under the differing conditions encountered in the field with respect to cable types, installation methods and environmental factors. Fault locating in duct and pipe installations is particularly problematic.

  In general, an attempt is first made to locate faults by visual means. Recently disturbed earth along a cable route, as an example, may indicate the possibility of a dig-in related fault. If the fault is not located during the visual inspection, conventional

fault locating techniques are employed, including resistance bridge, arc reflection method (ARM), audible discharge, radar and tone tracing. As a last resort, the cut and try method, which isolates and tests the cable in sections, is used.

- **High-Pressure Gas-Filled Pipe-Type Cable System**

The gas pressure stations required by HPGF cable systems require periodic maintenance. Pumps, piping, nitrogen gas regulators, fluid pressure control systems, and monitoring and alarm systems must be inspected, tested, monitored and maintained. Cathodic protection systems, when used, also require inspection, monitoring and maintenance.

Pipe leak and cable fault location procedures have been described previously herein. Splicing of HPGF cables is a very time consuming process. A splice is then installed and the pipe section is sleeved and pressure tested. A manhole is usually installed at the splice location.

HPGF cable system termination and splice location and repair procedures are identical to those utilized for solid dielectric cable systems.

- **Overhead vs Underground Transmission**

Maintenance of underground systems and equipment requires specialized skills and equipment different from those required for overhead system maintenance. The need for specialized skills and equipment and the difficulty of maintaining the skills at a high level of proficiency for maintenance of a limited amount of underground transmission should be considered when comparing overhead and underground maintenance costs.

Table A-5-1 summarizes outage times for solid dielectric and HPGF cable systems. The times shown include fault location and repair times only. If fault location and repair procedures are to be performed by a contractor, contract preparation, bid and award times, and contractor mobilization time must be added to the typical outage times shown in the table. Average outage times for overhead lines are shown in *Table A-5-2.*

TABLE A-5-1

Typical Outage Times (1) Underground Transmission

Cable System	Outage Time
XLPE	1 Week
HPGF	3 Weeks

Notes: (1) Significant variations in outage times will occur. They are installation method and trouble cause dependent.

TABLE A-5-2

Typical Outage Times Overhead Transmission

Outage Time Data Source	Line Operating Voltage	Outage Time
MAPP	230kV	15.5 Hours
MAPP	345kV	23.9 Hours
MAIN	345kV	22.1 Hours
AVERAGE		20.5 Hours

Cost Estimates

Tables A-5-3a through *A-5-6b* contain cost estimates for undergrounding the 115 kV transmission line cables across Beaver, Specie, Wilson and Sunshine mesas. *Tables A-5-7a* and *A-5-7b* are cost estimates for undergrounding the existing distribution lines across Specie Mesa.

Table A-5-3a

Beaver Mesa (Duct Bank)

Tri-State Generation & Transmission
Nucla-Telluride Transmission Line Project
115kV XLPE Cable System
Project No: 148467-02

Route 4 Beaver Mesa (Duct Bank) — **Prepared by: GVH**
Single Circuit 115kV 1 Cable/Phase — **Checked by: JAJ**
1250 kcmil CU XLPE
546 Amps
29,568 Feet
4 Number of Ducts

DESCRIPTION	QTY.	UNIT COSTS MATERIAL	UNIT COSTS LABOR	EXTENDED COSTS MATERIAL	EXTENDED COSTS LABOR	TOTAL COST
TRANSMISSION LINE						
Cable System Installation and Materials						
CABLE (ft)	90,478	$19	$3.00	$1,719,084	$271,434	$1,990,518
SPARE CABLE (ft)	2,000	$19	$0	$38,000	$0	$38,000
SPLICE (1-PHASE) (ea)	45	$5,500	$3,500	$247,500	$157,500	$405,000
SPARE SPLICE (1-PHASE) (ea)	1	$5,500	$0	$5,500	$0	$5,500
TERMINATIONS (ea)	6	$5,500	$5,000	$33,000	$30,000	$63,000
SPARE TERMINATIONS (ea)	1	$5,500	$0	$5,500	$0	$5,500
ARRESTERS (ea)	6	$2,000	$750	$12,000	$4,500	$16,500
GROUND LINK BOX, THREE PHASE	6	$2,400.00	$1.00	$14,400	$6	$14,406
LINK BOX W/ SVL'S THREE PHASE	12	$3,600.00	$1.00	$43,200	$12	$43,212
GROUND CONDUCTOR (ft)	29,568	$1.80	$1.00	$53,222	$29,568	$82,790
Earthwork 2 X 2 DUCT BANK						
6 IN CONDUIT & FITTINGS (ft)	118,272	$2	$10.00	$236,544	$1,182,720	$1,419,264
CONCRETE ENCASEMENT (cu yds)	4,380	$90	$35	$394,240	$153,316	$547,556
TRENCH/BACKFILL (ft)	29,568	$28	$65	$827,904	$1,921,920	$2,749,824
TRENCH/BACKFILL/FTB (ft) (Hand Dug)	0	$22	$200	$0	$0	$0
DEWATERING	0	$8	$15	$0	$0	$0
SHEETING & SHORING (ft)	800	$10	$20	$8,000	$16,000	$24,000
GEOTECH: Strength/Thermal (Lot)	1	$0	$20,000	$0	$20,000	$20,000
MANHOLES (ea)	15	$20,000	$13,000	$300,000	$195,000	$495,000
PAVEMENT (remove & replace/sq. ft)	0	$3.00	$8	$0	$0	$0
CONCRETE (remove & replace/sq. ft)	0	$3.50	$16	$0	$0	$0
HORIZONTAL DIRECTIONAL BORE (l.ft.)	500	$0	$250	$0	$125,000	$125,000
BORE C/ASING 24" (l.ft.), each bore 250 feet	500	$75	$25	$37,500	$12,500	$50,000
FILL CASING (cu yds)	36	$75	$50	$2,675	$1,784	$4,459
BORE SPACER'S (ea)	100	$200	$20	$20,000	$2,000	$22,000
LAND SCAPE and RESTORATION (lot)	0	$0	$50,000	$0	$0	$0
SOIL CONTAMINATION TESTING (lot)	0	$0	$3	$0	$0	$0
TRAFFIC CONTROL (2 people, 8hrs/day)	20	$0	$240	$0	$4,800	$4,800
MOB/DEMOB (ea)	1	$0	$50,000	$0	$50,000	$50,000
Termination Structures						
SUBSTATION TERMINATION STRUCTURES	2	$10,000	$2,000	$20,000	$4,000	$24,000
TERMINATION STRUCTURE FOUNDATION	4	$1,500	$750	$6,000	$3,000	$9,000
OVERHEAD HARDWARE	0	$0	$20,000	$0	$0	$0
RISER STRUCTURE (ea)	0	$35,000	$11,000	$0	$0	$0
RISER STRUCTURE FOUNDATION(ea)	0	$2,500	$2,500	$0	$0	$0
Subtotal Transmission Line				$4,024,269	$4,185,059	$8,209,329
	Cost Per Mile					**$1,465,952**
	SUB TOTALS			$4,024,269	$4,185,059	$8,209,329
Engineering						$194,000
Construction Support						$10,000
	SUBTOTAL					**$204,000**
	TOTAL					**$8,413,329**
	CONTINGENCY 15%					**$1,261,999**
	TOTAL					**$9,675,328**

Table A-5-3b

Beaver Mesa (Direct Bury)

Tri-State Generation & Transmission
Nucla-Telluride Transmission Line Project
115kV XLPE Cable System
Project No: 148467-02

Route 4 Beaver Mesa (Direct Bury) — Prepared by: GVH
Single Circuit 115kV 1 Cable/Phase — Checked by: JAJ
1250 kcmil CU XLPE
546 Amps
29,568 Feet
4 Number of Ducts

DESCRIPTION	QTY.	UNIT COSTS MATERIAL	UNIT COSTS LABOR	EXTENDED COSTS MATERIAL	EXTENDED COSTS LABOR	TOTAL COST
TRANSMISSION LINE						
Cable System Installation and Materials						
CABLE (ft)	90,478	$19	$3.00	$1,719,084	$271,434	$1,990,518
SPARE CABLE (ft)	3,000	$19	$0	$57,000	$0	$57,000
SPLICE (1-PHASE) (ea)	30	$5,500	$3,500	$165,000	$105,000	$270,000
SPARE SPLICE (1-PHASE) (ea)	1	$5,500	$0	$5,500	$0	$5,500
TERMINATIONS (ea)	6	$5,500	$5,000	$33,000	$30,000	$63,000
SPARE TERMINATIONS (ea)	1	$5,500	$0	$5,500	$0	$5,500
ARRESTERS (ea)	6	$2,000	$750	$12,000	$4,500	$16,500
GROUND LINK BOX, THREE PHASE	5	$2,400.00	$1.00	$12,000	$5	$12,005
LINK BOX W/ SVL'S THREE PHASE	8	$3,600.00	$1.00	$28,800	$8	$28,808
GROUND CONDUCTOR (ft)	29,568	$1.80	$1.00	$53,222	$29,568	$82,790
Earthwork 2 X 2 DUCT BANK						
6 IN CONDUIT & FITTINGS (ft)	0	$2	$10.00	$0	$0	$0
CONCRETE ENCASEMENT (cu yds)	2,568	$90	$35	$231,123	$89,881	$321,004
TRENCH/BACKFILL (ft)	29,568	$28	$65	$827,904	$1,921,920	$2,749,824
TRENCH/BACKFILL/FTB (ft) (Hand Dug)	0	$22	$200	$0	$0	$0
DEWATERING	0	$8	$15	$0	$0	$0
SHEETING & SHORING (ft)	800	$10	$20	$8,000	$16,000	$24,000
GEOTECH: Strength/Thermal (Lot)	1	$0	$20,000	$0	$20,000	$20,000
MANHOLES (ea)	10	$20,000	$13,000	$200,000	$130,000	$330,000
PAVEMENT (remove & replace/sq. ft)	0	$3.00	$8	$0	$0	$0
CONCRETE (remove & replace/sq. ft)	0	$3.50	$16	$0	$0	$0
HORIZONTAL DIRECTIONAL BORE (l.ft.)	500	$0	$250	$0	$125,000	$125,000
BORE C/ ASING 24" (l.ft.), Each Bore 250 feet	500	$75	$25	$37,500	$12,500	$50,000
FILL CASING (cu yds)	36	$75	$50	$2,675	$1,784	$4,459
BORE SPACER'S (ea)	100	$200	$20	$20,000	$2,000	$22,000
LAND SCAPE and RESTORATION (lot)	0	$0	$50,000	$0	$0	$0
SOIL CONTAMINATION TESTING (lot)	0	$0	$3	$0	$0	$0
TRAFFIC CONTROL (2 people, 8hrs/day)	20	$0	$240	$0	$4,800	$4,800
MOB/DEMOB (ea)	1	$0	$50,000	$0	$50,000	$50,000
Termination Structures						
SUBSTATION TERMINATION STRUCTURES	2	$10,000	$2,000	$20,000	$4,000	$24,000
TERMINATION STRUCTURE FOUNDATION	4	$1,500	$750	$6,000	$3,000	$9,000
OVERHEAD HARDWARE	0	$0	$20,000	$0	$0	$0
RISER STRUCTURE (ea)	0	$35,000	$11,000	$0	$0	$0
RISER STRUCTURE FOUNDATION(ea)	0	$2,500	$2,500	$0	$0	$0
Subtotal Transmission Line				$3,444,308	$2,821,400	$6,265,708
	Cost Per Mile					**$1,118,877**
	SUB TOTALS			$3,444,308	$2,821,400	$6,265,708
Engineering						$194,000
Construction Support						$10,000
	SUBTOTAL					**$204,000**
	TOTAL					**$6,469,708**
	CONTINGENCY 15%					**$970,456**
	TOTAL					**$7,440,165**

Table A-5-4a

Specie Mesa (Duct Bank)

Tri-State Generation & Transmission
Nucla-Telluride Transmission Line Project
115kV XLPE Cable System
Project No: 148467-02

Route 1 Specie Mesa (Duct Bank)
Single Circuit 115kV 1 Cable/Phase
1250 kcmil CU XLPE
546 Amps
20,000 Feet
4 Number of Ducts

Prepared by: GVH
Checked by: JAJ

DESCRIPTION	QTY.	UNIT COSTS MATERIAL	UNIT COSTS LABOR	EXTENDED COSTS MATERIAL	EXTENDED COSTS LABOR	TOTAL COST
TRANSMISSION LINE						
Cable System Installation and Materials						
CABLE (ft)	61,200	$19	$3.00	$1,162,800	$183,600	$1,346,400
SPARE CABLE (ft)	2,000	$19	$0	$38,000	$0	$38,000
SPLICE (1-PHASE) (ea)	30	$5,500	$3,500	$165,000	$105,000	$270,000
SPARE SPLICE (1-PHASE) (ea)	1	$5,500	$0	$5,500	$0	$5,500
TERMINATIONS (ea)	6	$5,500	$5,000	$33,000	$30,000	$63,000
SPARE TERMINATIONS (ea)	1	$5,500	$0	$5,500	$0	$5,500
ARRESTERS (ea)	6	$2,000	$750	$12,000	$4,500	$16,500
GROUND LINK BOX, THREE PHASE	5	$2,400.00	$1.00	$12,000	$5	$12,005
LINK BOX W/ SVL'S THREE PHASE	8	$3,600.00	$1.00	$28,800	$8	$28,808
GROUND CONDUCTOR (ft)	20,000	$1.80	$1.00	$36,000	$20,000	$56,000
Earthwork 2 X 2 DUCT BANK						
6 IN CONDUIT & FITTINGS (ft)	80,000	$2	$10.00	$160,000	$800,000	$960,000
CONCRETE ENCASEMENT (cu yds)	2,963	$90	$35	$266,667	$103,704	$370,370
TRENCH/BACKFILL (ft)	20,000	$28	$65	$560,000	$1,300,000	$1,860,000
TRENCH/BACKFILL/FTB (ft) (Hand Dug)	0	$22	$200	$0	$0	$0
DEWATERING	0	$8	$15	$0	$0	$0
SHEETING & SHORING (ft)	800	$10	$20	$8,000	$16,000	$24,000
GEOTECH: Strength/Thermal (Lot)	1	$0	$20,000	$0	$20,000	$20,000
MANHOLES (ea)	10	$20,000	$13,000	$200,000	$130,000	$330,000
PAVEMENT (remove & replace/sq. ft)	0	$3.00	$8	$0	$0	$0
CONCRETE (remove & replace/sq. ft)	0	$3.50	$16	$0	$0	$0
HORIZONTAL DIRECTIONAL BORE (l.ft.)	0	$0	$250	$0	$0	$0
BORE CASING 24" (l.ft.), Each bore 50 Feet	0	$75	$25	$0	$0	$0
FILL CASING (cu yds)	0	$75	$50	$0	$0	$0
BORE SPACER'S (ea)	0	$200	$20	$0	$0	$0
LAND SCAPE and RESTORATION (lot)	0	$0	$50,000	$0	$0	$0
SOIL CONTAMINATION TESTING (lot)	0	$0	$3	$0	$0	$0
TRAFFIC CONTROL (2 people, 8hrs/day)	20	$0	$240	$0	$4,800	$4,800
MOB/DEMOB (ea)	1	$0	$50,000	$0	$50,000	$50,000
Termination Structures						
SUBSTATION TERMINATION STRUCTURES	2	$10,000	$2,000	$20,000	$4,000	$24,000
TERMINATION STRUCTURE FOUNDATION	4	$1,500	$750	$6,000	$3,000	$9,000
OVERHEAD HARDWARE	0	$0	$20,000	$0	$0	$0
RISER STRUCTURE (ea)	0	$35,000	$11,000	$0	$0	$0
RISER STRUCTURE FOUNDATION(ea)	0	$2,500	$2,500	$0	$0	$0
Subtotal Transmission Line				$2,719,267	$2,774,617	$5,493,883
	Cost Per Mile					**$1,450,385**
	SUB TOTALS			$2,719,267	$2,774,617	$5,493,883
Engineering						$194,000
Construction Support						$10,000
	SUBTOTAL					**$204,000**
	TOTAL					**$5,697,883**
	CONTINGENCY 15%					**$854,683**
	TOTAL					**$6,552,566**

Table A-5-4b

Specie Mesa (Direct Bury)

Tri-State Generation & Transmission
Nucla-Telluride Transmission Line Project
115kV XLPE Cable System
Project No: 148467-02

Route 1 Specie Mesa (Direct Bury)
Single Circuit 115kV 1 Cable/Phase
1250 kcmil CU XLPE
546 Amps
20,000 Feet
4 Number of Ducts

Prepared by: GVH
Checked by: JAJ

DESCRIPTION	QTY.	UNIT COSTS MATERIAL	UNIT COSTS LABOR	EXTENDED COSTS MATERIAL	EXTENDED COSTS LABOR	TOTAL COST
TRANSMISSION LINE						
Cable System Installation and Materials						
CABLE (ft)	61,200	$19	$3.00	$1,162,800	$183,600	$1,346,400
SPARE CABLE (ft)	3,000	$19	$0	$57,000	$0	$57,000
SPLICE (1-PHASE) (ea)	21	$5,500	$3,500	$115,500	$73,500	$189,000
SPARE SPLICE (1-PHASE) (ea)	1	$5,500	$0	$5,500	$0	$5,500
TERMINATIONS (ea)	6	$5,500	$5,000	$33,000	$30,000	$63,000
SPARE TERMINATIONS (ea)	1	$5,500	$0	$5,500	$0	$5,500
ARRESTERS (ea)	6	$2,000	$750	$12,000	$4,500	$16,500
GROUND LINK BOX, THREE PHASE	4	$2,400.00	$1.00	$9,600	$4	$9,604
LINK BOX W/ SVL'S THREE PHASE	6	$3,600.00	$1.00	$21,600	$6	$21,606
GROUND CONDUCTOR (ft)	20,000	$1.80	$1.00	$36,000	$20,000	$56,000
Earthwork 2 X 2 DUCT BANK						
6 IN CONDUIT & FITTINGS (ft)	0	$2	$10.00	$0	$0	$0
CONCRETE ENCASEMENT (cu yds)	1,737	$90	$35	$156,333	$60,796	$217,130
TRENCH/BACKFILL (ft)	20,000	$28	$65	$560,000	$1,300,000	$1,860,000
TRENCH/BACKFILL/FTB (ft) (Hand Dug)	0	$22	$200	$0	$0	$0
DEWATERING	0	$8	$15	$0	$0	$0
SHEETING & SHORING (ft)	800	$10	$20	$8,000	$16,000	$24,000
GEOTECH: Strength/Thermal (Lot)	1	$0	$20,000	$0	$20,000	$20,000
MANHOLES (ea)	7	$20,000	$13,000	$140,000	$91,000	$231,000
PAVEMENT (remove & replace/sq. ft)	0	$3.00	$8	$0	$0	$0
CONCRETE (remove & replace/sq. ft)	0	$3.50	$16	$0	$0	$0
HORIZONTAL DIRECTIONAL BORE (l.ft.)	0	$0	$250	$0	$0	$0
BORE CASING 24" (l.ft.), Each bore 50 Feet	0	$75	$25	$0	$0	$0
FILL CASING (cu yds)	0	$75	$50	$0	$0	$0
BORE SPACER'S (ea)	0	$200	$20	$0	$0	$0
LAND SCAPE and RESTORATION (lot)	0	$0	$50,000	$0	$0	$0
SOIL CONTAMINATION TESTING (lot)	0	$0	$3	$0	$0	$0
TRAFFIC CONTROL (2 people, 8hrs/day)	20	$0	$240	$0	$4,800	$4,800
MOB/DEMOB (ea)	1	$0	$50,000	$0	$50,000	$50,000
Termination Structures						
SUBSTATION TERMINATION STRUCTURES	2	$10,000	$2,000	$20,000	$4,000	$24,000
TERMINATION STRUCTURE FOUNDATION	4	$1,500	$750	$6,000	$3,000	$9,000
OVERHEAD HARDWARE	0	$0	$20,000	$0	$0	$0
RISER STRUCTURE (ea)	0	$35,000	$11,000	$0	$0	$0
RISER STRUCTURE FOUNDATION(ea)	0	$2,500	$2,500	$0	$0	$0
Subtotal Transmission Line				$2,348,833	$1,861,206	$4,210,040
	Cost Per Mile					$1,111,450
	SUB TOTALS			$2,348,833	$1,861,206	$4,210,040
Engineering						$194,000
Construction Support						$10,000
	SUBTOTAL					$204,000
	TOTAL					$4,414,040
	CONTINGENCY 15%					$662,106
	TOTAL					$5,076,146

Table A-5-5a

Wilson Mesa (Duct Bank)

Tri-State Generation & Transmission
Nucla-Telluride Transmission Line Project
115kV XLPE Cable System
Project No: 148467-02

Route 2 Wilson Mesa (Duct Bank) — Prepared by: GVH
Single Circuit 115kV 1 Cable/Phase — Checked by: JAJ
1250 kcmil CU XLPE
546 Amps
29,200 Feet
4 Number of Ducts

DESCRIPTION	QTY.	UNIT COSTS MATERIAL	UNIT COSTS LABOR	EXTENDED COSTS MATERIAL	EXTENDED COSTS LABOR	TOTAL COST
TRANSMISSION LINE						
Cable System Installation and Materials						
CABLE (ft)	89,352	$19	$3.00	$1,697,688	$268,056	$1,965,744
SPARE CABLE (ft)	2,000	$19	$0	$38,000	$0	$38,000
SPLICE (1-PHASE) (ea)	45	$5,500	$3,500	$247,500	$157,500	$405,000
SPARE SPLICE (1-PHASE) (ea)	1	$5,500	$0	$5,500	$0	$5,500
TERMINATIONS (ea)	6	$5,500	$5,000	$33,000	$30,000	$63,000
SPARE TERMINATIONS (ea)	1	$5,500	$0	$5,500	$0	$5,500
ARRESTERS (ea)	6	$2,000	$750	$12,000	$4,500	$16,500
GROUND LINK BOX, THREE PHASE	6	$2,400.00	$1.00	$14,400	$6	$14,406
LINK BOX W/ SVL'S THREE PHASE	11	$3,600.00	$1.00	$39,600	$11	$39,611
GROUND CONDUCTOR (ft)	29,200	$1.80	$1.00	$52,560	$29,200	$81,760
Earthwork 2 X 2 DUCT BANK						
6 IN CONDUIT & FITTINGS (ft)	116,800	$2	$10.00	$233,600	$1,168,000	$1,401,600
CONCRETE ENCASEMENT (cu yds)	4,326	$90	$35	$389,333	$151,407	$540,741
TRENCH/BACKFILL (ft)	29,200	$28	$65	$817,600	$1,898,000	$2,715,600
TRENCH/BACKFILL/FTB (ft) (Hand Dug)	0	$22	$200	$0	$0	$0
DEWATERING	0	$8	$15	$0	$0	$0
SHEETING & SHORING (ft)	800	$10	$20	$8,000	$16,000	$24,000
GEOTECH: Strength/Thermal (Lot)	1	$0	$20,000	$0	$20,000	$20,000
MANHOLES (ea)	15	$20,000	$13,000	$300,000	$195,000	$495,000
PAVEMENT (remove & replace/sq. ft)	0	$3.00	$8	$0	$0	$0
CONCRETE (remove & replace/sq. ft)	0	$3.50	$16	$0	$0	$0
HORIZONTAL DIRECTIONAL BORE (l.ft.)	0	$0	$250	$0	$0	$0
BORE CASING 24" (l.ft.), Each bore 50 Feet	0	$75	$25	$0	$0	$0
FILL CASING (cu yds)	0	$75	$50	$0	$0	$0
BORE SPACER'S (ea)	0	$200	$20	$0	$0	$0
LAND SCAPE and RESTORATION (lot)	0	$0	$50,000	$0	$0	$0
SOIL CONTAMINATION TESTING (lot)	0	$0	$3	$0	$0	$0
TRAFFIC CONTROL (2 people, 8hrs/day)	20	$0	$240	$0	$4,800	$4,800
MOB/DEMOB (ea)	1	$0	$50,000	$0	$50,000	$50,000
Termination Structures						
SUBSTATION TERMINATION STRUCTURES	2	$10,000	$2,000	$20,000	$4,000	$24,000
TERMINATION STRUCTURE FOUNDATION	4	$1,500	$750	$6,000	$3,000	$9,000
OVERHEAD HARDWARE	0	$0	$20,000	$0	$0	$0
RISER STRUCTURE (ea)	0	$35,000	$11,000	$0	$0	$0
RISER STRUCTURE FOUNDATION(ea)	0	$2,500	$2,500	$0	$0	$0
Subtotal Transmission Line				$3,920,281	$3,999,480	$7,919,762
	Cost Per Mile					**$1,432,067**
	SUB TOTALS			$3,920,281	$3,999,480	$7,919,762
Engineering						$194,000
Construction Support						$10,000
	SUBTOTAL					**$204,000**
	TOTAL					**$8,123,762**
	CONTINGENCY 15%					**$1,218,564**
	TOTAL					**$9,342,326**

Table A-5-5b

Wilson Mesa (Direct Bury)

Tri-State Generation & Transmission
Nucla-Telluride Transmission Line Project
115kV XLPE Cable System
Project No: 148467-02

Route 2 Wilson Mesa (Direct Bury) — Prepared by: GVH
Single Circuit 115kV 1 Cable/Phase — Checked by: JAJ
1250 kcmil CU XLPE
546 Amps
29,200 Feet
4 Number of Ducts

DESCRIPTION	QTY.	UNIT COSTS MATERIAL	UNIT COSTS LABOR	EXTENDED COSTS MATERIAL	EXTENDED COSTS LABOR	TOTAL COST
TRANSMISSION LINE						
Cable System Installation and Materials						
CABLE (ft)	89,352	$19	$3.00	$1,697,688	$268,056	$1,965,744
SPARE CABLE (ft)	3,000	$19	$0	$57,000	$0	$57,000
SPLICE (1-PHASE) (ea)	30	$5,500	$3,500	$165,000	$105,000	$270,000
SPARE SPLICE (1-PHASE) (ea)	1	$5,500	$0	$5,500	$0	$5,500
TERMINATIONS (ea)	6	$5,500	$5,000	$33,000	$30,000	$63,000
SPARE TERMINATIONS (ea)	1	$5,500	$0	$5,500	$0	$5,500
ARRESTERS (ea)	6	$2,000	$750	$12,000	$4,500	$16,500
GROUND LINK BOX, THREE PHASE	5	$2,400.00	$1.00	$12,000	$5	$12,005
LINK BOX W/ SVL'S THREE PHASE	8	$3,600.00	$1.00	$28,800	$8	$28,808
GROUND CONDUCTOR (ft)	29,200	$1.80	$1.00	$52,560	$29,200	$81,760
Earthwork 2 X 2 DUCT BANK						
6 IN CONDUIT & FITTINGS (ft)	0	$2	$10.00	$0	$0	$0
CONCRETE ENCASEMENT (cu yds)	2,536	$90	$35	$228,247	$88,763	$317,009
TRENCH/BACKFILL (ft)	29,200	$28	$65	$817,600	$1,898,000	$2,715,600
TRENCH/BACKFILL/FTB (ft) (Hand Dug)	0	$22	$200	$0	$0	$0
DEWATERING	0	$8	$15	$0	$0	$0
SHEETING & SHORING (ft)	800	$10	$20	$8,000	$16,000	$24,000
GEOTECH: Strength/Thermal (Lot)	1	$0	$20,000	$0	$20,000	$20,000
MANHOLES (ea)	10	$20,000	$13,000	$200,000	$130,000	$330,000
PAVEMENT (remove & replace/sq. ft)	0	$3.00	$8	$0	$0	$0
CONCRETE (remove & replace/sq. ft)	0	$3.50	$16	$0	$0	$0
HORIZONTAL DIRECTIONAL BORE (l.ft.)	0	$0	$250	$0	$0	$0
BORE CASING 24" (l.ft.), Each bore 50 Feet	0	$75	$25	$0	$0	$0
FILL CASING (cu yds)	0	$75	$50	$0	$0	$0
BORE SPACER'S (ea)	0	$200	$20	$0	$0	$0
LAND SCAPE and RESTORATION (lot)	0	$0	$50,000	$0	$0	$0
SOIL CONTAMINATION TESTING (lot)	0	$0	$3	$0	$0	$0
TRAFFIC CONTROL (2 people, 8hrs/day)	20	$0	$240	$0	$4,800	$4,800
MOB/DEMOB (ea)	1	$0	$50,000	$0	$50,000	$50,000
Termination Structures						
SUBSTATION TERMINATION STRUCTURES	2	$10,000	$2,000	$20,000	$4,000	$24,000
TERMINATION STRUCTURE FOUNDATION	4	$1,500	$750	$6,000	$3,000	$9,000
OVERHEAD HARDWARE	0	$0	$20,000	$0	$0	$0
RISER STRUCTURE (ea)	0	$35,000	$11,000	$0	$0	$0
RISER STRUCTURE FOUNDATION(ea)	0	$2,500	$2,500	$0	$0	$0
Subtotal Transmission Line				$3,348,895	$2,651,332	$6,000,226
	Cost Per Mile					**$1,084,972**
	SUB TOTALS			$3,348,895	$2,651,332	$6,000,226
Engineering						$194,000
Construction Support						$10,000
	SUBTOTAL					**$204,000**
	TOTAL					**$6,204,226**
	CONTINGENCY 15%					**$930,634**
	TOTAL					**$7,134,860**

Table A-5-6a

Sunshine Mesa (Duct Bank)

Tri-State Generation & Transmission
Nucla-Telluride Transmission Line Project
115kV XLPE Cable System
Project No: 148467-02

Route 3 Sunshine Mesa (Duct Bank) — Prepared by: GVH
Single Circuit 115kV 1 Cable/Phase — Checked by: JAJ
1250 kcmil CU XLPE
546 Amps
3,168 Feet
4 Number of Ducts

DESCRIPTION	QTY.	UNIT COSTS MATERIAL	UNIT COSTS LABOR	EXTENDED COSTS MATERIAL	EXTENDED COSTS LABOR	TOTAL COST
TRANSMISSION LINE						
Cable System Installation and Materials						
CABLE (ft)	9,694	$19	$3.00	$184,188	$29,082	$213,270
SPARE CABLE (ft)	2,000	$19	$0	$38,000	$0	$38,000
SPLICE (1-PHASE) (ea)	3	$5,500	$3,500	$16,500	$10,500	$27,000
SPARE SPLICE (1-PHASE) (ea)	1	$5,500	$0	$5,500	$0	$5,500
TERMINATIONS (ea)	6	$5,500	$5,000	$33,000	$30,000	$63,000
SPARE TERMINATIONS (ea)	1	$5,500	$0	$5,500	$0	$5,500
ARRESTERS (ea)	6	$2,000	$750	$12,000	$4,500	$16,500
GROUND LINK BOX, THREE PHASE	2	$2,400.00	$1.00	$4,800	$2	$4,802
LINK BOX W/ SVL'S THREE PHASE	2	$3,600.00	$1.00	$7,200	$2	$7,202
GROUND CONDUCTOR (ft)	3,168	$1.80	$1.00	$5,702	$3,168	$8,870
Earthwork 2 X 2 DUCT BANK						
6 IN CONDUIT & FITTINGS (ft)	12,672	$2	$10.00	$25,344	$126,720	$152,064
CONCRETE ENCASEMENT (cu yds)	469	$90	$35	$42,240	$16,427	$58,667
TRENCH/BACKFILL (ft)	3,168	$28	$65	$88,704	$205,920	$294,624
TRENCH/BACKFILL/FTB (ft) (Hand Dug)	0	$22	$200	$0	$0	$0
DEWATERING	0	$8	$15	$0	$0	$0
SHEETING & SHORING (ft)	800	$10	$20	$8,000	$16,000	$24,000
GEOTECH: Strength/Thermal (Lot)	1	$0	$20,000	$0	$20,000	$20,000
MANHOLES (ea)	1	$20,000	$13,000	$20,000	$13,000	$33,000
PAVEMENT (remove & replace/sq. ft)	0	$3.00	$8	$0	$0	$0
CONCRETE (remove & replace/sq. ft)	0	$3.50	$16	$0	$0	$0
HORIZONTAL DIRECTIONAL BORE (l.ft.)	0	$0	$250	$0	$0	$0
BORE CASING 24" (l.ft.), Each bore 50 Feet	0	$75	$25	$0	$0	$0
FILL CASING (cu yds)	0	$75	$50	$0	$0	$0
BORE SPACER'S (ea)	0	$200	$20	$0	$0	$0
LAND SCAPE and RESTORATION (lot)	0	$0	$50,000	$0	$0	$0
SOIL CONTAMINATION TESTING (lot)	0	$0	$3	$0	$0	$0
TRAFFIC CONTROL (2 people, 8hrs/day)	20	$0	$240	$0	$4,800	$4,800
MOB/DEMOB (ea)	1	$0	$50,000	$0	$50,000	$50,000
Termination Structures						
SUBSTATION TERMINATION STRUCTURES	2	$10,000	$2,000	$20,000	$4,000	$24,000
TERMINATION STRUCTURE FOUNDATION	4	$1,500	$750	$6,000	$3,000	$9,000
OVERHEAD HARDWARE	0	$0	$20,000	$0	$0	$0
RISER STRUCTURE (ea)	0	$35,000	$11,000	$0	$0	$0
RISER STRUCTURE FOUNDATION(ea)	0	$2,500	$2,500	$0	$0	$0
Subtotal Transmission Line				$522,678	$537,121	$1,059,799
	Cost Per Mile					**$1,766,331**
	SUB TOTALS			$522,678	$537,121	$1,059,799
Engineering						$194,000
Construction Support						$10,000
	SUBTOTAL					**$204,000**
	TOTAL					**$1,263,799**
	CONTINGENCY 15%					**$189,570**
	TOTAL					**$1,453,369**

Table A-5-6b

Sunshine Mesa (Direct Bury)

Tri-State Generation & Transmission
Nucla-Telluride Transmission Line Project
115kV XLPE Cable System
Project No: 148467-02

Route 3 Sunshine Mesa (Direct Bury) — **Prepared by: GVH**
Single Circuit 115kV 1 Cable/Phase — **Checked by: JAJ**
1250 kcmil CU XLPE
546 Amps
3,168 Feet
4 Number of Ducts

DESCRIPTION	QTY.	UNIT COSTS MATERIAL	UNIT COSTS LABOR	EXTENDED COSTS MATERIAL	EXTENDED COSTS LABOR	TOTAL COST
TRANSMISSION LINE						
Cable System Installation and Materials						
CABLE (ft)	9,694	$19	$3.00	$184,188	$29,082	$213,270
SPARE CABLE (ft)	3,000	$19	$0	$57,000	$0	$57,000
SPLICE (1-PHASE) (ea)	0	$5,500	$3,500	$0	$0	$0
SPARE SPLICE (1-PHASE) (ea)	0	$5,500	$0	$0	$0	$0
TERMINATIONS (ea)	6	$5,500	$5,000	$33,000	$30,000	$63,000
SPARE TERMINATIONS (ea)	1	$5,500	$0	$5,500	$0	$5,500
ARRESTERS (ea)	6	$2,000	$750	$12,000	$4,500	$16,500
GROUND LINK BOX, THREE PHASE	1	$2,400.00	$1.00	$2,400	$1	$2,401
LINK BOX W/ SVL'S THREE PHASE	1	$3,600.00	$1.00	$3,600	$1	$3,601
GROUND CONDUCTOR (ft)	3,168	$1.80	$1.00	$5,702	$3,168	$8,870
Earthwork 2 X 2 DUCT BANK						
6 IN CONDUIT & FITTINGS (ft)	0	$2	$10.00	$0	$0	$0
CONCRETE ENCASEMENT (cu yds)	275	$90	$35	$24,763	$9,630	$34,393
TRENCH/BACKFILL (ft)	3,168	$28	$65	$88,704	$205,920	$294,624
TRENCH/BACKFILL/FTB (ft) (Hand Dug)	0	$22	$200	$0	$0	$0
DEWATERING	0	$8	$15	$0	$0	$0
SHEETING & SHORING (ft)	800	$10	$20	$8,000	$16,000	$24,000
GEOTECH: Strength/Thermal (Lot)	1	$0	$20,000	$0	$20,000	$20,000
MANHOLES (ea)	0	$20,000	$13,000	$0	$0	$0
PAVEMENT (remove & replace/sq. ft)	0	$3.00	$8	$0	$0	$0
CONCRETE (remove & replace/sq. ft)	0	$3.50	$16	$0	$0	$0
HORIZONTAL DIRECTIONAL BORE (l.ft.)	0	$0	$250	$0	$0	$0
BORE CASING 24" (l.ft.), Each bore 50 Feet	0	$75	$25	$0	$0	$0
FILL CASING (cu yds)	0	$75	$50	$0	$0	$0
BORE SPACER'S (ea)	0	$200	$20	$0	$0	$0
LAND SCAPE and RESTORATION (lot)	0	$0	$50,000	$0	$0	$0
SOIL CONTAMINATION TESTING (lot)	0	$0	$3	$0	$0	$0
TRAFFIC CONTROL (2 people, 8hrs/day)	20	$0	$240	$0	$4,800	$4,800
MOB/DEMOB (ea)	1	$0	$50,000	$0	$50,000	$50,000
Termination Structures						
SUBSTATION TERMINATION STRUCTURES	2	$10,000	$2,000	$20,000	$4,000	$24,000
TERMINATION STRUCTURE FOUNDATION	4	$1,500	$750	$6,000	$3,000	$9,000
OVERHEAD HARDWARE	0	$0	$20,000	$0	$0	$0
RISER STRUCTURE (ea)	0	$35,000	$11,000	$0	$0	$0
RISER STRUCTURE FOUNDATION(ea)	0	$2,500	$2,500	$0	$0	$0
Subtotal Transmission Line				$450,857	$380,102	$830,959
	Cost Per Mile					**$1,384,932**
	SUB TOTALS			$450,857	$380,102	$830,959
Engineering						$194,000
Construction Support						$10,000
	SUBTOTAL					**$204,000**
	TOTAL					**$1,034,959**
	CONTINGENCY 15%					**$155,244**
	TOTAL					**$1,190,203**

Table A-5-7a

Specie Mesa (Duct Bank)

Tri-State Generation & Transmission
Nucla-Telluride Transmission Line Project
Distribution Cable System
Project No: 148467-02

Route 1 Specie Mesa (Duct Bank) — Prepared by: GVH
Single Circuit Distribution — Checked by: JAJ

20,000 Feet
2 Number of Ducts

DESCRIPTION	QTY.	UNIT COSTS MATERIAL	UNIT COSTS LABOR	EXTENDED COSTS MATERIAL	EXTENDED COSTS LABOR	TOTAL COST
DISTRIBUTION LINE						
Cable System Installation and Materials						
CABLE (ft)	61,200	$10	$0.75	$612,000	$45,900	$657,900
SPARE CABLE (ft)	0	$10	$0	$0	$0	$0
SPLICE (1-PHASE) (ea)	99	$500	$200	$49,500	$19,800	$69,300
SPARE SPLICE (1-PHASE) (ea)	0	$500	$0	$0	$0	$0
TERMINATIONS (ea)	6	$500	$200	$3,000	$1,200	$4,200
SPARE TERMINATIONS (ea)	0	$500	$0	$0	$0	$0
ARRESTERS (ea)	6	$200	$100	$1,200	$600	$1,800
Earthwork 1 X 2 DUCT BANK						
6 IN CONDUIT & FITTINGS (ft)	40,000	$2	$10.00	$80,000	$400,000	$480,000
CONCRETE ENCASEMENT (cu yds)	1,481	$90	$35	$133,333	$51,852	$185,185
TRENCH/BACKFILL (ft)	20,000	$28	$65	$560,000	$1,300,000	$1,860,000
TRENCH/BACKFILL/FTB (ft) (Hand Dug)	0	$22	$200	$0	$0	$0
DEWATERING	0	$8	$15	$0	$0	$0
SHEETING & SHORING (ft)	800	$10	$20	$8,000	$16,000	$24,000
GEOTECH: Strength/Thermal (Lot)	0	$0	$20,000	$0	$0	$0
MANHOLES Distribution (ea)	33	$8,000	$2,000	$264,000	$66,000	$330,000
PAVEMENT (remove & replace/sq. ft)	0	$3.00	$8	$0	$0	$0
CONCRETE (remove & replace/sq. ft)	0	$3.50	$16	$0	$0	$0
HORIZONTAL DIRECTIONAL BORE (l.ft.)	0	$0	$250	$0	$0	$0
BORE CASING 24" (l.ft.), Each bore 50 Feet	0	$75	$25	$0	$0	$0
FILL CASING (cu yds)	0	$75	$50	$0	$0	$0
BORE SPACER'S (ea)	0	$200	$20	$0	$0	$0
LAND SCAPE and RESTORATION (lot)	0	$0	$50,000	$0	$0	$0
SOIL CONTAMINATION TESTING (lot)	0	$0	$3	$0	$0	$0
TRAFFIC CONTROL (2 people, 8hrs/day)	20	$0	$240	$0	$4,800	$4,800
MOB/DEMOB (ea)	1	$0	$10,000	$0	$10,000	$10,000
Termination Structures						
SUBSTATION TERMINATION STRUCTURES	0	$10,000	$2,000	$0	$0	$0
TERMINATION STRUCTURE FOUNDATION	0	$1,500	$750	$0	$0	$0
OVERHEAD HARDWARE	0	$0	$20,000	$0	$0	$0
RISER STRUCTURE (ea)	0	$35,000	$11,000	$0	$0	$0
RISER STRUCTURE FOUNDATION(ea)	0	$2,500	$2,500	$0	$0	$0
DISTRIBUTION RISER POLE	2	$1,000	$1,500	$2,000	$3,000	$5,000
Subtotal Distribution Line				$1,711,033	$1,916,152	$3,632,185
	Cost Per Mile					$958,897
	SUB TOTALS			$1,711,033	$1,916,152	$3,632,185
Engineering						$40,000
Construction Support						$10,000
	SUBTOTAL					**$50,000**
	TOTAL					**$3,682,185**
	CONTINGENCY 15%					**$552,328**
	TOTAL					**$4,234,513**

Assumptions:

Table A-5-7b

Specie Mesa (Direct Buried)

Tri-State Generation & Transmission
Nucla-Telluride Transmission Line Project
Distribution Cable System
Project No: 148467-02

Route 1 Specie Mesa (Direct Buried) — **Prepared by: GVH**
Single Circuit Distribution — **Checked by: JAJ**

20,000 Feet
0 Number of Ducts

DESCRIPTION	QTY.	UNIT COSTS MATERIAL	UNIT COSTS LABOR	EXTENDED COSTS MATERIAL	EXTENDED COSTS LABOR	TOTAL COST
DISTRIBUTION LINE						
Cable System Installation and Materials						
CABLE (ft)	61,200	$10	$0.75	$612,000	$45,900	$657,900
SPARE CABLE (ft)	0	$10	$0	$0	$0	$0
SPLICE (1-PHASE) (ea)	99	$500	$200	$49,500	$19,800	$69,300
SPARE SPLICE (1-PHASE) (ea)	0	$500	$0	$0	$0	$0
TERMINATIONS (ea)	6	$500	$200	$3,000	$1,200	$4,200
SPARE TERMINATIONS (ea)	0	$500	$0	$0	$0	$0
ARRESTERS (ea)	6	$200	$100	$1,200	$600	$1,800
Earthwork 1 X 2 DUCT BANK						
6 IN CONDUIT & FITTINGS (ft)	0	$2	$10.00	$0	$0	$0
CONCRETE ENCASEMENT (cu yds)	0	$90	$35	$0	$0	$0
TRENCH/BACKFILL (ft)	20,000	$15	$30	$300,000	$600,000	$900,000
TRENCH/BACKFILL/FTB (ft) (Hand Dug)	0	$22	$200	$0	$0	$0
DEWATERING	0	$8	$15	$0	$0	$0
SHEETING & SHORING (ft)	800	$10	$20	$8,000	$16,000	$24,000
GEOTECH: Strength/Thermal (Lot)	0	$0	$20,000	$0	$0	$0
MANHOLES Distribution (ea)	33	$8,000	$2,000	$264,000	$66,000	$330,000
PAVEMENT (remove & replace/sq. ft)	0	$3.00	$8	$0	$0	$0
CONCRETE (remove & replace/sq. ft)	0	$3.50	$16	$0	$0	$0
HORIZONTAL DIRECTIONAL BORE (l.ft.)	0	$0	$250	$0	$0	$0
BORE CASING 24" (l.ft.), Each bore 50 Feet	0	$75	$25	$0	$0	$0
FILL CASING (cu yds)	0	$75	$50	$0	$0	$0
BORE SPACER'S (ea)	0	$200	$20	$0	$0	$0
LAND SCAPE and RESTORATION (lot)	0	$0	$50,000	$0	$0	$0
SOIL CONTAMINATION TESTING (lot)	0	$0	$3	$0	$0	$0
TRAFFIC CONTROL (2 people, 8hrs/day)	20	$0	$240	$0	$4,800	$4,800
MOB/DEMOB (ea)	1	$0	$10,000	$0	$10,000	$10,000
Termination Structures						
SUBSTATION TERMINATION STRUCTURES	0	$10,000	$2,000	$0	$0	$0
TERMINATION STRUCTURE FOUNDATION	0	$1,500	$750	$0	$0	$0
OVERHEAD HARDWARE	0	$0	$20,000	$0	$0	$0
RISER STRUCTURE (ea)	0	$35,000	$11,000	$0	$0	$0
RISER STRUCTURE FOUNDATION(ea)	0	$2,500	$2,500	$0	$0	$0
DISTRIBUTION RISER POLE	2	$1,000	$1,500	$2,000	$3,000	$5,000
Subtotal Distribution Line				$1,237,700	$764,300	$2,007,000
	Cost Per Mile					**$529,848**
	SUB TOTALS			$1,237,700	$764,300	$2,007,000
Engineering						$40,000
Construction Support						$10,000
	SUBTOTAL					**$50,000**
	TOTAL					**$2,057,000**
	CONTINGENCY 15%					**$308,550**
	TOTAL					**$2,365,550**

Assumptions:

Only one distribution circuit with one spare 6" conduit provided in estimate.

The distribution cable is triplexed or all three cable can be installed in same 6" duct.

Supplemental Information on Directional Drilling

OVERVIEW OF HORIZONTAL DIRECTIONAL DRILLING (HDD)

DEVELOPMENT AND USES

Originally used in the 1970s, directional crossings are a marriage of conventional road boring and directional drilling of oil wells. Pipelines have been installed for carrying oil, natural gas, water and other products using HDD. Ducts have been installed to carry electric and fiber optic cables. Besides crossing under rivers and waterways, HDD installations have been made crossing under highways, railroads, airport runways, shore approaches, islands, areas congested with buildings, pipeline corridors and future water channels.

Technology Limits

The longest installation, since the inception of HDD, has been about 6,000 feet with pipe diameters up to 60 inches. Although directional drilling was originally used primarily on the U.S. Gulf Coast through alluvial soils, more and more crossings are being undertaken through gravel, cobble, glacial till and hard rock. Adequate space must be available to allow rigs to set up for the duration of the installation.

Advantages

HDD installations have the least environmental impact of any alternate method. The technology also offers maximum depth of cover under the obstacle, thereby affording maximum protection and minimizing maintenance costs. HDD crossings have a reasonably predictable and short construction schedule. Directional drilling may minimize social impacts such as extensive highway closures and traffic congestion under the right conditions. Perhaps most significant advantage is that HDD crossings are in select cases, less expensive than other methods.

MACHINE TYPES

There are several types of machines available for HDD. They are primarily separated into small or mini, medium and large sizes, according to thrust and pull back force capabilities.

Small or mini size rigs have thrust and pull back forces of less than 30,000 pounds. Typically these rigs have ranges limited to 2 to 300 feet and can install 2 to 6 inch product casings.

Medium size rigs have thrust and pull back forces in the range of 30 to 100,000 pounds. Ranges are longer with the upper limit approaching 1,500 to 2,000 feet. These rigs can install 6 to 20 inch product casings, depending on length and specific forces.

Large size rigs have thrust and pull back forces in the range of 125 to 750,000 pounds. Ranges of installation can exceed 5,000 feet and product casings can be 6 to 60 inches.

Technique

A pilot hole is drilled beginning at a prescribed angle from horizontal and continues under and across the obstacle along a design profile made up of straight tangents and long radius arcs. Concurrent to drilling the pilot hole, the contractor may elect to run a larger diameter "wash pipe" that will encase the pilot drill string. The wash pipe acts as a conductor casing providing rigidity to the smaller diameter pilot drill string and will also save the drilled hole, should it be necessary to retract the pilot string for bit changes. The directional control is brought about by a small bend in the drill string just behind the cutting head. The pilot drill string is not rotated except to orient the bend. If the bend is oriented to the right, the drill path then proceeds in a smooth radius bend to the right. The drill path is monitored by an electronic package housed in the pilot drill string near the cutting head. The electronic package detects the relationship of the drill string to the earth's magnetic field, gravitational field and its inclination. This data is transmitted back to the surface where calculations are made as to the location of the cutting head. Surface location of the drill head also can be used where there is reasonable access.

Once the pilot hole is complete, the hole must be enlarged to a suitable diameter for the product pipeline. For instance, if the pipeline to be installed is 36 inch in diameter, the hole may be enlarged to 48-inch diameter or larger. This is accomplished by "pre-reaming" the hole to successively larger diameters. Generally, the reamer is attached to the drill string on the bank opposite the drilling rig and pulled back into the pilot hole. Joints of drill pipe are added as the

reamer makes its way back to the drilling rig. Large quantities of slurry are pumped into the hole to maintain the integrity of the hole and to flush out cuttings.

Once the drilled hole is enlarged, the product pipeline can be pulled through it. The pipeline is pre-fabricated at the end of the bore opposite the drilling rig. A reamer is attached to the drill string and then connected to the pipeline pullhead via a swivel. The swivel prevents any translation of the reamer's rotation into the pipeline string allowing for a smooth pull into the drilled hole. The drilling rig then begins the pullback operation, rotating and pulling on the drill string and once again circulating high volumes of drilling slurry. The pullback continues until the reamer and pipeline break ground at the drilling rig.

After the pipe has been pulled through the drilled hole, bore spacers and conduit are installed in the pipe. The bore spacers are typically spaced five feet apart to allow support of the conduit. Once the conduit is installed, one end of the pipe is temporarily sealed and grout is pumped into the opposite end until the pipe system is full.

Prior to construction there are several activities that must be accomplished. These activities include: soil borings, thermal resistivity testing of the soil and surveying the route. The daily activities for a typical HDD operation are presented below. This timetable is based on drilling 1200 feet.

Mobilize: The mobilization of the HDD equipment will require a minimum of 30 days with an additional minimum 30 days notice.

Day 1: The drilling equipment is setup. (This assumes setup location has been identified and approved by Tri-State and Permitting Agencies)

Day 1-5: Product casing is laid out and prepared on exit side of the drilling operation.

Day 2: Excavation and setup of entry position and the anticipated exit position is located.

Day 2-4: The pilot hole is drilled beginning at the prescribed angle and under and across the obstacle along the designed profile. Expected minimum drilling rate of 40 feet/hour for the pilot hole (30 drilling hours based on 12 hour shifts).

Day 5: The drilling equipment is reset for back ream and pullback of product pipe.

Day 6-8: The drilled hole is enlarged and the product pipe (casing) is pulled into the enlarged borehole. Expected drilling rate of 35 feet/hour for the back ream and casing installation. (30 drilling hours based on 12 hour shifts).

Day 8: The area around the exit hole is excavated and the casing lowered to design depth and configuration.

Day 9: The drilling equipment is disassembled and demobilized.

Day 10: The area around the entry hole is excavated and the casing lowered to the design depth and configuration. The equipment for the conduit installation is setup.

Day 11-12: The installation of the bore spacers and conduit are installed in the pipe. Once the conduit is installed, grout is pumped into the pipe system.

Day 13: Installation of the open cut ductbank begins.

LAYOUT AND DESIGN

Heavy equipment is required at both ends of the installation. This equipment must remain in position while the installation progresses to completion.

Work Space

The rig spread requires a minimum 100-feet wide by 150-feet long area as shown in Figure 1. This area should extend from the entry point away from the installation, although the entry point should be at least 10 feet inside the prescribed area. Since many components of the rig spread have no predetermined position, the rig site can be made up of smaller irregular areas. Operations are facilitated if the area is level, hardstanding and clear of overhead obstructions. The drilling operation requires large volumes of water for the mixing of the drilling slurry. A nearby source of water is necessary.

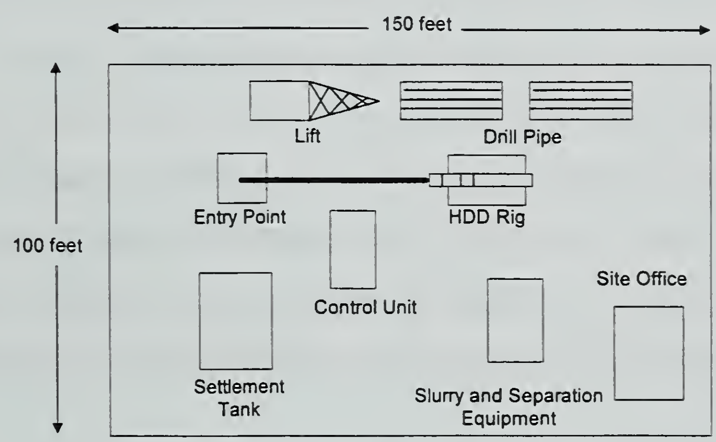


Figure 1: Typical HDD Setup Area

Strong consideration should be given to provide a sufficient length of workspace to fabricate the product pipeline into one string. The width will be as necessary for normal pipeline construction although a workspace of 100-feet wide by 150-feet long should be provided at the exit point. The length will assure that during the pullback the pipe can be installed in one uninterrupted operation. Tie-ins of successive strings during the pullback operation increase the risk considerably because of the tension changes going from dynamic friction to static friction with respect to the product being used.

Once the work locations have been chosen, the area should be surveyed and detailed drawings prepared. The eventual accuracy of the drill profile and alignment is dependent on the accuracy of the survey information.

Profile Design Parameters

Once the installation profile has been taken and the geotechnical investigation completed, a determination of the depth of cover under the existing groundline is made. Factors considered may be the presence of existing pipeline or cable crossings at the locations along the desired route. Minimum depth recommended is 10 feet to prevent loss of drilling fluids.

An entry angle between 8° and 20° can be used for most installations. It is preferable that straight tangent sections are drilled before the introduction of a long radius curve. The radius of the curve is determined by the bending characteristic of the product pipeline, increasing with the diameter. A general "rule of thumb" for the radius of curvature is 100 feet/inch diameter for steel line pipe. The curve usually brings the profile to the elevation providing the design cover of the pipeline under groundline and obstructions. Long horizontal runs can be made at this elevation before curving up towards the exit point. Exit angle should be kept between 5° and 12° to facilitate handling of the product pipeline during pullback. Most downhole survey tools are electronic devices that give a magnetic azimuth (for "right/left" control) and inclination (for "up/down" control). Surface locators can also be used in conjunction with the downhole electronic package.

Normally, survey calculations are conducted every 30 feet during pilot hole operations. The contractor should provide as-built drawings that are based on these calculations. Alternate methods such as gyroscoping, ground penetrating radar or sound transmitting devices may also be used to determine the as-built position.

APPENDIX B

BIOLOGICAL RESOURCES

KEA Environmental, Inc.

In Association with BIOLogic, Inc.

November 2001

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1.0 INTRODUCTION

The Biological Resources Appendix B contains supporting information to the EIS analysis. The following types of information are contained in this appendix:

- Methodology – for vegetation community mapping and surveys
- Explanation of Species Not Evaluated
- GIS Data Tables B-1 through B-10 – including potential impacts to vegetation communities and sensitive biological resources by jurisdiction and alternative.
- Table B-11 – Listing of Other Special-Status Plant and Animal Species Occurring or Potentially Occurring Within the Nucla-Telluride Transmission Line Project Study Area

2.0 METHODOLOGY

2.1 VEGETATION COMMUNITY MAPPING AND BOTANICAL ANALYSIS

The vegetation community descriptions and distinctions presented herein are based on the Southwest Colorado Interagency Vegetation Classification Project. The vegetation categories are based on the classification system devised by Anderson *et al* (1976) titled *A Land Use and Land Cover Classification System for Use with Remote Sensor Data*. Vegetation maps, based on Landsat imagery, were used as an aid to the vegetation community mapping conducted for the project. As part of the focused field efforts, all vegetation communities within the project alternative corridors were delineated through photographic interpretation using 1:6,000 orthophoto base maps with topography (aerial photo taken September 1997). Subsequently, the majority of the project alternative corridors were surveyed and the mapped polygons and cover types were adjusted as needed. It is estimated that over 70 percent of the polygons drawn on the vegetation maps were ground-truthed either by traversing through the habitat on foot or vehicle, or through the use of binoculars.

No focused surveys for rare plants known for, or potentially occurring within, the project vicinity were conducted during the field assessments of the project alternative corridors. Information on sensitive plant species was obtained through literature and database review and communication with government agency personnel.

2.2 WILDLIFE ANALYSIS

Information on the invertebrate, aquatic, and wildlife species known or expected to occur in the project area was obtained through literature and database review, consultations with government agency personnel, field visits made during the summer of 1997 (by foot, vehicle, and helicopter overflight) and additional surveys as presented below.

Supplemental wildlife surveys determined to be necessary for the EIS analysis were limited to those habitats with the potential to support three highly sensitive, or regionally significant, species of concern: Mexican spotted owl, Gunnison sage grouse, and bald eagle. Surveys for additional wildlife species of concern, as needed, will be conducted once a final preferred alignment is selected. The surveys that were conducted were limited to the extent of suitable habitat identified for the project area and as corroborated with the resource agencies.

Surveys for the Mexican spotted owl were conducted using the most recent USFS Region 2 survey protocol, as modified per agreement with Craig Grother, Zone Biologist at the USFS office in Norwood during communications in April 1998. The areas surveyed included suitable habitat

near or within Fall Creek, Naturita Canyon, Ilium Valley, San Miguel Canyon from Ilium Valley west to Fall Creek, Beaver Canyon,

Big Bear Creek, and Bilk Creek. Where possible throughout the survey area, the survey points were accessed by vehicle, and where necessary, survey points were accessed entirely on foot. The total area surveyed for Mexican spotted owl included all suitable habitat within the project alternative corridors, and all suitable areas within one mile of either side of the study corridor. All areas were assessed over four survey periods between early May and early July 1998, and between mid May and late June 1999.

For the Gunnison sage grouse, Colorado Division of Wildlife (CDOW) informal protocol for estimating populations was followed. As part of the NEPA environmental analysis for this project, the USFS required a survey of the historic Gunnison sage grouse range on Beaver Mesa (Grother 1998). The Beaver Mesa area was determined to be the extent of the area needed for focused surveys for the project. Approximately 6 square miles of privately-owned ranch land on Beaver Mesa was historically occupied by sage grouse. The existing 69 kV transmission line bisects the historic range on Beaver Mesa, and two other transmission lines also bisect the historic range in different directions. The entire Beaver Mesa was surveyed between mid-April and mid-May, 1998.

The areas to be surveyed for bald eagles for the project assessments were determined through discussions with numerous agency personnel in January 1998. Field surveys for bald eagle were performed February 4 - 7, 1998, primarily on Wrights Mesa, and along the San Miguel River from Saltado Canyon west to about one mile west of the project area boundary. Likely roost sites were visited at least once, or more to clarify observations made on the initial visit. To obtain the most accurate count of bald eagles at roost sites, surveys were conducted immediately after dawn, to observe eagles leaving the roost sites, and from late afternoon to dusk, to observe eagles returning to the roost sites. During midday hours, observers also searched for additional roost sites, and visited historic and likely foraging areas and noted presence and activity of bald eagles. Other raptors and any species of interest to the project were also noted.

In addition to the wildlife surveys for Mexican spotted owl, Gunnison sage grouse, and bald eagle as noted above, one survey was conducted to map habitat suitable for the southwestern willow flycatcher and boreal toad that occurs within approximately one-half mile of the project alternative corridors. On May 27, 1999 all alternative alignments were flown over via helicopter and areas appearing suitable for occupation by southwestern willow flycatcher and boreal toad were delineated onto color 1:24000 orthophoto base maps (aerial photo taken September 1997). These areas, plus locations previously identified as suitable for southwestern willow flycatcher, are the basis for identifying where and whether potential effects to these two species could occur. Protocol surveys to determine whether southwestern willow flycatcher and boreal toad are present in the suitable habitat areas identified would be conducted, as needed, after selection of the preferred alignment.

2.3 Description of Species Not Evaluated

A number of the sensitive plant and animal species listed in *Table 3.6-3* and Appendix B were evaluated for their potential to occur in the project area and likelihood for being affected by the project. After analysis, many of these species were determined to be unaffected by, or not applicable to, the project. A brief discussion of why these species are not applicable to the project is presented below; these species will not be further discussed in this report.

The clay-loving wild buckwheat and the Uinta Basin hookless cactus are the two federally listed plant species with the closest proximity to the project area. Both are associated with shrublands,

on either clay-shale or adobe soils, respectively. The project area is outside of the known range of these plant species. The proposed project would have no effect on these species.

The federally listed fish species, humpback chub, bonytail chub, Colorado pikeminnow, and razorback sucker, do not occur in the San Miguel River in the project area, although suitable habitat exists downstream beginning at about the confluence of the San Miguel River with the Dolores River. Because the project would not result in water depletions or a decrease in water quality, no impacts to these species would occur.

The federally listed endangered black-footed ferret is not known to have ever inhabited the project area. Vegetation communities and terrain are suitable for black-footed ferrets in lower elevation grass-forb rangeland and sagebrush in the western third of the project area. However, ferrets also require extensive and viable prairie dog towns for shelter and prey. While white-tailed prairie dogs exist in parts of the project area, prairie dog population densities are too low and distribution is too fragmented to provide suitable habitat for black-footed ferrets (Ferguson 1999 pers. comm.). The project would have no effect on black-footed ferrets.

The sensitive species bluehead sucker, flannelmouth sucker, roundtail chub, Colorado River cutthroat trout, and northern river otter all inhabit the San Miguel River and its tributaries in the project area or downstream from it. As noted above, because the project would not result in water depletions or a decrease in water quality, no impacts to these species would occur.

The sensitive American peregrine falcon occasionally occurs in the project area, but is not known to nest within several miles. The project would not affect peregrine falcon nesting; all project alternatives involve a slight chance of collision of a migrating or foraging falcon with transmission lines, but the impact is considered low for all alternatives.

Two additional sensitive raptor species, osprey and ferruginous hawk, could occur as migrants, but no suitable breeding habitat exists in the project area. These species have never been known to breed in or near the project area; therefore, the project would have no effect on these species.

The sensitive butterflies possibly occurring in the project area (sister, great purple hairstreak, Edith's cooper, two-banded skipper, and Great Basin silverspot) are not likely to be affected by the project, because only a negligible amount of rangeland, shrub, and pinyon-juniper woodland habitat would be permanently removed. Furthermore, the minimization of impacts to native habitats would be assured through project compliance with Tri-State's EMPs and, where the project traverses USFS or BLM land, BMPs required by these agencies on public land. These up-front mitigation measures would require minimizing disturbance to natural vegetation within and outside of the right-of-way, further assuring that the project would have a negligible effect on sensitive butterflies.

Similar to the sensitive butterflies, the sensitive loggerhead shrike, possibly occurring in the project area, is not likely to be affected by the project. This sensitive bird inhabits low-statured vegetation communities (*i.e.*, rangelands, croplands, and pinyon-juniper woodlands), and only a negligible amount of the habitat for loggerhead shrike would be removed for the proposed project.

No sizeable areas of habitat that support sensitive terrestrial reptiles and small mammals including the Utah milk snake, midget faded rattlesnake, white-tailed antelope squirrel, Ord's kangaroo rat, white-throated woodrat, and ringtail would be permanently altered by the project; therefore, these species would not be affected by the proposed actions. Mortality of some individuals from construction or maintenance operations is possible, but the overall effect on populations would be negligible and the project would have a low or no impact on these species.

Sensitive bat species including Townsend's big-eared bat, spotted bat, fringe-tailed myotis, and Yuma myotis may occur in the project area. The project would not cause disturbance to nursery colonies or other day-roosting bats in caves, inactive mines, or rock crevices. The small amount of natural vegetation affected by the project would result in a low effect on populations of these bat species.

Wolverines have never been recorded in the project area, and require very large expanses of relatively undisturbed boreal forest habitat that no longer exist there. The project would not affect the wolverine.

Although black bear are common in the project area, the USFS is concerned about the management of this species. However, the small amount of natural vegetation removed or altered by the project would not negatively impact black bear, and may actually enhance black bear habitat in forested areas by creating small forest openings dominated by early seral stage vegetation. Construction and maintenance activities from spring through fall may cause slight disturbance to black bears, but the impacts are considered low for all alternatives.

Table B-1
Potential Impacts to Vegetation Communities and Land Cover Types from the Proposed Nucla-Norwood Northern Alternative

Vegetation Communities	115 kV Transmission Line			Distribution System (Acres)	Total Impacts (Acres)
	All Other Access (Acres)	Widened Roads and Spur Roads (Acres)	115 kV Total (Acres)		
Rangeland					
Grass/Forb Rangeland (GRF)	17.59	0.00	17.59	0.00	**17.59**
Sagebrush Parkland (SGP)	1.61	0.26	1.87	0.00	**1.87**
Sagebrush/Grass Mix (SGG)	13.83	0.00	13.83	0.00	**13.83**
Rangeland Totals	**33.03**	**0.26**	**33.29**	**0.00**	33.29
Woodland					
Pinyon-Juniper (PJN)	55.59	5.13	60.72	0.00	**60.72**
Gambel Oak (GOK)	0.39	0.00	0.39	0.00	**0.39**
Pinyon-Juniper/Sagebrush Mix (PSX)	3.68	0.00	3.68	0.00	**3.68**
Pinyon-Juniper/Mountain Shrub Mix (PMX)	3.46	0.03	3.49	0.00	**3.49**
Woodland Totals	**63.12**	**5.16**	**68.28**	**0.00**	68.28
Riparian					
Riparian (RIP)	0.37	0.00	0.37	0.00	**0.37**
Riparian Totals	**0.37**	**0.00**	**0.37**	**0.00**	0.37
Subtotal of Impacts to the Natural Vegetation Communities	**96.52**	**5.42**	**101.94**	**0.00**	101.94
Other Land Cover Types					
Rock (RCK)	0.38	0.00	0.38	0.00	**0.38**
Urban/Built Up (URB)	1.59	0.00	1.59	0.00	**1.59**
Agriculture (AGR)	93.56	2.06	95.62	0.00	**95.62**
Subtotal of Impacts to Other Land Cover Types	**95.53**	**2.06**	**97.59**	**0.00**	97.59
Total Impacts from the Proposed Project	**192.05**	**7.48**	**199.53**	**0.00**	199.53

Table B-2
Potential Impacts to Sensitive Biological Resources from the Nucla-Norwood Northern Alternative by Jurisdiction

Sensitive Resource	USFS (Acres)	BLM (Acres)	State (Acres)	Private (Acres)	Total Impacts (Acres)
Riparian (RIP)	0.00	0.37	0.00	0.00	0.37
Bald eagle – impacts via placement of ROW within 1 mile of daytime concentration area	0.00	16.58	0.00	178.40	194.98
Southwestern willow flycatcher – impacts via placement of ROW within 1/4 mile of potential habitat	0.00	1.00	0.00	18.40	19.40
Elk – indirect construction impacts via placement of ROW within 1 mile of winter range.	0.00	17.81	0.00	181.71	199.52
Elk – indirect construction impacts via placement of ROW within 1 mile of winter concentration areas.	0.00	10.57	0.00	21.28	31.85
Elk – indirect construction impacts via placement of ROW within 1 mile of severe winter range.	0.00	17.81	0.00	178.50	196.31
Deer – indirect construction impacts via placement of ROW within 1 mile of winter range.	0.00	17.81	0.00	181.71	199.52
Deer – indirect construction impacts via placement of ROW within 1 mile of winter concentration areas.	0.00	17.81	0.00	165.96	183.77
Deer – indirect construction impacts via placement of ROW within 1 mile of severe winter range.	0.00	17.81	0.00	178.35	196.16

Table B-3
Potential Impacts to Vegetation Communities and Land Cover Types from the Proposed Nucla-Norwood Central Alternative

Vegetation Communities	115 kV Transmission Line			Distribution System (Acres)	Total Impacts (Acres)
	All Other Access (Acres)	Widened Roads and Spur Roads (Acres)	115 kV Total (Acres)		
Rangeland					
Grass/Forb Rangeland (GRF)	0.55	6.48	7.03	17.57	**24.60**
Sagebrush Parkland (SGP)	1.61	2.37	3.98	0.00	**3.98**
Sagebrush/Grass Mix (SGG)	0.08	36.66	36.74	13.75	**50.49**
Rangeland Totals	**2.24**	**45.51**	**47.75**	**31.32**	**79.07**
Woodland					
Pinyon-Juniper (PJN)	43.41	73.83	117.24	48.11	**165.35**
Gambel Oak (GOK)	0.39	0.00	0.39	0.00	**0.39**
Pinyon-Juniper/Sagebrush Mix (PSX)	0.53	21.63	22.16	3.17	**25.33**
Pinyon-Juniper/Mountain Shrub Mix (PMX)	4.17	0.03	4.20	0.00	**4.20**
Woodland Totals	**48.50**	**95.49**	**143.99**	**51.28**	**195.27**
Riparian					
Riparian (RIP)	0.45	0.57	1.02	0.36	**1.38**
Riparian Totals	**0.45**	**0.57**	**1.02**	**0.36**	**1.38**
Subtotal of Impacts to the Natural Vegetation Communities	**51.19**	**141.57**	**192.76**	**82.96**	**275.72**
Other Land Cover Types					
Rock (RCK)	0.87	0.00	0.87	0.38	**1.25**
Urban/Built Up (URB)	0.00	2.86	2.86	0.67	**3.53**
Agriculture (AGR)	38.70	2.06	40.76	57.94	**98.70**
Subtotal of Impacts to Other Land Cover Types	**39.57**	**4.92**	**44.49**	**58.99**	**103.48**
Total Impacts from the Proposed Project	**90.76**	**146.49**	**237.25**	**141.95**	**379.20**

Table B-4 **Potential Impacts to Sensitive Biological Resources from the Nucla-Norwood Central Alternative by Jurisdiction**					
Sensitive Resource	**USFS** (Acres)	**BLM** (Acres)	**State** (Acres)	**Private** (Acres)	**Table Impacts** (Acres)
Riparian (RIP)	0.00	0.10	0.00	0.91	**1.01**
Gunnison sage grouse - impacts via placement of ROW within 1 mile of overall range	0.00	26.18	0.00	14.67	**40.85**
Bald eagle – impacts via placement of ROW within 1 mile of daytime concentration area	0.00	14.06	4.65	102.48	**121.19**
Elk - indirect construction impacts via placement of ROW within 1 mile of winter range.	0.00	57.34	12.22	167.68	**237.24**
Elk – indirect construction impacts via placement of ROW within 1 mile of winter concentration areas.	0.00	6.25	0.00	31.68	**37.93**
Elk – indirect construction impacts via placement of ROW within 1 mile of severe winter range.	0.00	57.34	12.22	164.48	**234.04**
Deer – indirect construction impacts via placement of ROW within 1 mile of winter range.	0.00	57.34	12.22	167.68	**237.24**
Deer - indirect construction impacts via placement of ROW within 1 mile of winter concentration areas.	0.00	57.34	12.22	151.93	**221.49**
Deer - indirect construction impacts via placement of ROW within 1 mile of severe winter range.	0.00	57.34	12.22	164.48	**234.04**

Table B-5
Potential Impacts to Vegetation Communities and Land Cover Types from the Proposed Nucla-Norwood Southern Alternative

Vegetation Communities	115 kV Transmission Line			Distribution System (Acres)	Total Impacts (Acres)
	All Other Access (Acres)	Widened Roads and Spur Roads (Acres)	115 kV Total (Acres)		
Rangeland					
Grass/Forb Rangeland (GRF)	0.02	6.48	6.50	17.58	**24.08**
Sagebrush Parkland (SGP)	0.00	2.12	2.12	1.86	**3.98**
Sagebrush/Grass Mix (SGG)	0.00	39.77	39.77	13.82	**53.59**
Rangeland Totals	**0.02**	**48.37**	**48.39**	**33.26**	**81.65**
Woodland					
Pinyon-Juniper (PJN)	8.83	78.92	87.75	60.71	**148.46**
Gambel Oak (GOK)	0.00	0.00	0.00	0.39	**0.39**
Pinyon-Juniper/Sagebrush Mix (PSX)	2.85	53.69	56.54	3.67	**60.21**
Pinyon-Juniper/Mountain Shrub Mix (PMX)	9.04	3.96	13.00	3.49	**16.49**
Woodland Totals	**20.72**	**136.57**	**157.29**	**68.26**	**225.55**
Forest Land					
Douglas Fir/Gambel Oak Type (DFG)	2.49	0.00	2.49	0.00	**2.49**
Forest Land Totals	**2.49**	**0.00**	**2.49**	**0.00**	**2.49**
Riparian					
Riparian (RIP)	0.24	0.74	0.98	0.36	**1.34**
Riparian Totals	**0.24**	**0.74**	**0.98**	**0.36**	**1.34**
Subtotal of Impacts to the Natural Vegetation Communities	**23.47**	**185.68**	**209.15**	**101.88**	**311.03**
Other Land Cover Types					
Rock (RCK)	0.00	0.00	0.00	0.38	**0.38**
Urban/Built Up (URB)	0.00	2.86	2.86	0.67	**3.53**
Agriculture (AGR)	9.36	0.00	9.36	95.61	**104.97**
Subtotal of Impacts to Other Land Cover Types	**9.36**	**2.86**	**12.22**	**96.66**	**108.88**
Total Impacts from the Proposed Project	**32.83**	**188.54**	**221.37**	**198.54**	**419.91**

Table B-6
Potential Impact to Sensitive Biological Resources from the Nucla-Norwood Southern Alternative by Jurisdiction

Sensitive Resource	USFS (Acres)	BLM (Acres)	State (Acres)	Private (Acres)	Total Impacts (Acres)
Riparian (RIP)	0.00	0.52	0.00	0.46	**0.98**
Gunnison sage grouse - impacts via placement of ROW within 1 mile of overall range	0.00	26.18	0.00	14.67	**40.85**
Bald eagle - impacts via placement of ROW within 1 mile of daytime concentration area.	0.00	19.65	0.00	25.66	**45.31**
Mexican spotted owl – impacts via placement of ROW within habitat	0.00	6.41	0.00	0.04	**6.45**
Elk – indirect construction impacts via placement of ROW within 1 mile of winter range.	0.00	107.12	0.00	114.24	**221.36**
Elk – indirect construction impacts via placement of ROW within 1 mile of winter concentration areas.	0.00	42.72	0.00	30.61	**73.33**
Elk – indirect construction impacts via placement of ROW within 1 mile of severe winter range.	0.00	107.12	0.00	110.61	**217.73**
Deer – indirect construction impacts via placement of ROW within 1 mile of winter range.	0.00	107.12	0.00	114.25	**221.37**
Deer – indirect construction impacts via placement of ROW within 1 mile of winter concentration areas.	0.00	107.12	0.00	114.25	**221.37**
Deer - indirect construction impacts via placement of ROW within 1 mile of severe winter range.	0.00	107.12	0.00	109.99	**217.11**

Table B-7
Potential Impacts to Vegetation Communities and Land Cover Types from the Proposed Norwood-Sunshine Alternative

Vegetation Communities	115 kV Transmission Line			Distribution System (Acres)	Total Impacts (Acres)
	All Other Access (Acres)	Widened Roads and Spur Roads (Acres)	115 kV Total (Acres)		
Rangeland					
Grass/Forb Rangeland (GRF)	138.66	4.38	143.04	8.27	**151.31**
Sagebrush/Grass Mix (SGG)	24.39	0.00	24.39	0.00	**24.39**
Rangeland Totals	**163.05**	**4.38**	**167.43**	**8.27**	**175.70**
Woodland					
Pinyon-Juniper (PJN)	3.04	0.00	3.04	0.00	**3.04**
Gambel Oak (GOK)	77.97	5.14	83.11	0.22	**83.33**
Pinyon-Juniper/Sagebrush Mix (PSX)	0.17	0.00	0.17	0.00	**0.17**
Pinyon-Juniper/Mountain Shrub Mix (PMX)	17.06	11.74	28.80	0.00	**28.80**
Woodland Totals	**98.24**	**16.88**	**115.12**	**0.22**	**115.34**
Forest Land					
Aspen (ASP)	23.43	0.00	23.43	0.00	**23.43**
Englemann Spruce (ESP)	1.57	0.00	1.57	0.00	**1.57**
Douglas Fir (DFR)	3.36	0.00	3.36	0.00	**3.36**
Douglas Fir/Open Type (DFO)	2.68	0.00	2.68	0.00	**2.68**
Ponderosa Pine/Gambel Oak Mix (PPG)	9.99	1.59	11.58	0.00	**11.58**
Douglas Fir/Gambel Oak Type (DFG)	2.94	0.00	2.94	0.00	**2.94**
Douglas Fir/Aspen/Gambel Oak Type (DAO)	0.58	0.00	0.58	0.00	**0.58**
Englemann Spruce/Aspen Mix (ESA)	1.25	0.00	1.25	0.00	**1.25**
Forest Land Totals	**45.80**	**1.59**	**47.39**	**0.00**	**47.39**
Riparian					
Riparian (RIP)	4.22	0.46	4.68	0.00	**4.68**
Upland Willow Scrub (UWS)	0.76	0.00	0.76	0.00	**0.76**
Riparian Totals	**4.98**	**0.46**	**5.44**	**0.00**	**5.44**
Subtotal of Impacts to the Natural Vegetation Communities	**312.07**	**23.31**	**335.38**	**8.49**	**343.87**
Other Land Cover Types					
Urban/Built Up (URB)	0.20	0.00	0.20	0.00	**0.20**
Agriculture (AGR)	.14	0.00	7.14	14.10	**21.24**
Subtotal of Impacts to Other Land Cover Types	**7.34**	**0.00**	**7.34**	**14.10**	**21.44**
Total Impacts from the Proposed Project	**319.41**	**23.31**	**342.72**	**22.59**	**365.31**

Table B-8
Potential Impacts to Sensitive Biological Resources from the Proposed Norwood-Sunshine Alternative by Jurisdiction

Sensitive Resource	USFS (Acres)	BLM		State (Acres)	Private (Acres)	Total Impacts (Acres)
		Resource Mgmt. Area Emphasis "L" (Acres)	All Other BLM Land (Acres)			
Riparian (RIP)	3.07	0.40	0.00	0.00	1.21	**4.68**
Upland Willow Scrub (UWS)	0.00	0.00	0.00	0.00	0.76	**0.76**
Mexican spotted owl – impacts via placement of ROW within potential habitat	13.65	8.07	0.16	0.00	25.87	**47.75**
Bald Eagle – impacts via placement of ROW within 1 mile of daytime concentration area.	0.00	0.00	0.00	0.00	24.74	**24.74**
Boreal toad – impacts via placement of ROW within 1/2 mile of potential habitat	13.14	0.00	0.16	7.33	123.45	**144.08**
Southwestern willow flycatcher – impacts via placement of ROW within 1/4 mile of potential habitat	13.65	0.00	0.00	0.00	13.31	**26.96**
Gunnison sage grouse - impacts via placement of ROW within 1 mile of lek sites	0.00	0.00	0.00	0.00	19.11	**19.11**
Gunnison sage grouse - impacts via placement of ROW within 2 miles of lek sites	0.00	0.00	0.00	0.00	47.12	**47.12**
Gunnison sage grouse - impacts via placement of ROW within 1 mile of nesting habitat	0.00	2.26	0.17	0.00	44.73	**47.16**
Gunnison sage grouse - impacts via placement of ROW within 2 miles of nesting habitat	0.00	4.43	0.17	0.00	68.38	**72.98**
Gunnison sage grouse - impacts via placement of ROW within 1 mile of overall range	0.00	4.43	0.17	0.00	62.80	**67.40**
Elk – indirect construction impacts via placement of ROW within 1 mile of winter range.	13.65	12.50	0.34	7.33	272.92	**306.74**
Elk – indirect construction impacts via placement of ROW within 1 mile of winter concentration areas.	0.00	8.07	0.16	7.33	149.05	**164.61**
Elk – indirect construction impacts via placement of ROW within 1 mile of severe winter range.	13.65	8.07	0.16	7.33	117.66	**146.87**
Elk – indirect construction impacts via placement of ROW within 1 mile of calving areas.	5.76	0.00	0.00	0.00	46.77	**52.53**
Elk – indirect construction impacts to elk migration corridors by traversing known corridors with the ROW	0.00	0.00	0.00	0.00	21.08	**21.08**
Deer - indirect construction impacts via placement of ROW within 1 mile of winter range.	13.65	8.07	0.16	7.33	188.37	**217.58**
Deer - indirect construction impacts via placement of ROW within 1 mile of winter concentration areas.	0.00	8.07	0.00	0.00	105.41	**113.48**
Deer - indirect construction impacts via placement of ROW within 1 mile of severe winter range.	13.65	8.07	0.16	7.33	101.30	**130.51**

Table B-9 **Potential Impacts to Vegetation Communities and Land Cover Types from the Proposed Norwood-Telluride Alternative**					
Vegetation Communities	**115 kV Transmission Line**			**Distribution System** (Acres)	**Total Impacts** (Acres)
	All Other Access (Acres)	**Widened Roads and Spur Roads** (Acres)	**115 kV Total** (Acres)		
Rangeland					
Grass/Forb Rangeland (GRF)	69.75	4.39	74.14	83.52	**157.66**
Sagebrush/Grass Mix (SGG)	24.39	0.00	24.39	0.00	**24.39**
Rangeland Totals	**94.14**	**4.39**	**98.53**	**83.52**	**182.05**
Woodland					
Pinyon-Juniper (PJN)	3.04	0.00	3.04	0.00	**3.04**
Gambel Oak (GOK)	73.11	5.14	78.25	15.92	**94.17**
Pinyon-Juniper/Sagebrush Mix (PSX)	0.17	0.00	0.17	0.00	**0.17**
Pinyon-Juniper/Mountain Shrub Mix (PMX)	17.06	11.74	28.80	0.00	**28.80**
Woodland Totals	**93.38**	**16.88**	**110.26**	**15.92**	**126.18**
Forest Land					
Aspen (ASP)	24.60	0.00	24.60	17.79	**42.39**
Englemann Spruce (ESP)	0.55	0.00	0.55	1.57	**2.12**
Douglas Fir (DFR)	19.76	0.00	19.76	3.35	**23.11**
Douglas Fir/Open Type (DFO)	6.78	0.00	6.78	2.67	**9.45**
Ponderosa Pine/Douglas Fir Mix (PDX)	9.94	0.00	9.94	0.00	**9.94**
Ponderosa Pine/Gambel Oak (PPG)	8.92	1.59	10.51	1.06	**11.57**
Douglas Fir/Gambel Oak Type (DFG)	15.19	0.00	15.19	2.94	**18.13**
Douglas Fir/Aspen Mix (DFA)	29.25	0.00	29.25	0.00	**29.25**
Douglas Fir/Aspen/Gambel Oak Type (DAO)	3.79	0.00	3.79	0.58	**4.37**
Englemann Spruce/Aspen Mix (ESA)	6.01	0.00	6.01	1.25	**7.26**
Forest Land Totals	**24.79**	**1.59**	**126.38**	**31.21**	**157.59**
Riparian					
Riparian (RIP)	10.21	0.46	10.67	3.42	**14.09**
Upland Willow Scrub (UWS)	0.22	0.00	0.22	0.53	**0.75**
Riparian Totals	**10.43**	**0.46**	**10.89**	**3.95**	**14.84**
Subtotal of Impacts to the Natural Vegetation Communities	**322.74**	**23.32**	**346.06**	**134.60**	**480.66**
Other Land Cover Types					
Rock (RCK)	2.97	0.00	2.97	0.00	**2.97**
Urban/Built Up (URB)	1.78	0.00	1.78	0.20	**1.98**
Agriculture (AGR)	7.14	0.00	7.14	14.10	**21.24**
Subtotal of Impacts to Other Land Cover Types	**11.89**	**0.00**	**11.89**	**14.30**	**26.19**
Total Impacts from the Proposed Project	**334.63**	**23.32**	**357.95**	**148.90**	**506.85**

Table B-10
Potential Impacts to Sensitive Biological Resources from the Norwood-Telluride Alternative by Jurisdiction

Sensitive Resource	USFS (Acres)	BLM		State (Acres)	Private (Acres)	Total Impacts (Acres)
		Resource Mgmt. Area Emphasis "L" (Acres)	All Other BLM Land (Acres)			
Riparian (RIP)	0.00	0.40	1.36	0.00	7.42	**9.18**
Upland Willow Scrub (UWS)	0.00	0.00	0.00	0.00	0.22	**0.22**
Mexican spotted owl – impacts via placement of ROW within potential habitat	8.81	8.07	63.25	0.00	53.39	**133.52**
Bald eagle–impacts via placement of ROW within 1 mile of daytime concentration area.	0.00	0.00	0.00	0.00	24.74	**24.74**
Boreal toad – impacts via placement of ROW within 1/2 mile of potential habitat	1.63	0.00	6.85	0.00	71.23	**79.71**
Southwestern willow flycatcher – impacts via placement of ROW within 1/4 miles or 150 feet	4.57	0.00	4.64	0.00	22.91	**32.12**
Gunnison sage grouse - impacts via placement of ROW within 1 mile of lek sites	0.00	0.00	0.00	0.00	19.11	**19.11**
Gunnison sage grouse - impacts via placement of ROW within 2 miles of lek sites	0.00	0.00	0.00	0.00	47.12	**47.12**
Gunnison sage grouse - impacts via placement of ROW within 1 mile of nesting habitat	0.00	2.26	0.17	0.00	44.73	**47.16**
Gunnison sage grouse - impacts via placement of ROW within 2 miles of nesting habitat	0.00	4.43	0.17	0.00	68.38	**72.98**
Gunnison sage grouse - impacts via placement of ROW within 1 mile of overall range	0.00	4.43	0.17	0.00	62.80	**67.40**
Elk - indirect construction impacts via placement of ROW within 1 mile of winter range.	0.00	12.50	64.15	0.00	236.52	**313.17**
Elk - indirect construction impacts via placement of ROW within 1 mile of winter concentration areas.	0.00	8.07	24.50	0.00	132.27	**164.84**
Elk – indirect construction impacts via placement of ROW within 1 mile of severe winter range.	0.00	8.07	63.98	0.00	141.10	**213.15**
Elk – indirect construction impacts via placement of ROW within 1 mile of calving areas.	0.00	0.00	0.00	0.00	0.00	**0.00**
Elk – indirect construction impacts to elk migration corridors by traversing known corridors with the ROW	0.00	0.00	0.00	0.00	0.00	**0.00**
Deer – indirect construction impacts via placement of ROW within 1 mile of winter range.	8.81	8.07	63.98	0.00	211.81	**292.67**
Deer – indirect construction impacts via placement of ROW within 1 mile of winter concentration areas.	0.00	8.07	0.00	0.00	105.41	**113.48**
Deer – indirect construction impacts via placement of ROW within 1 mile of severe winter range.	8.81	8.07	63.98	0.00	124.73	**205.59**

Table B-11
Other Special-Status Plant and Animal Species Occurring Or Potentially Occurring Within the Nucla-Telluride Transmission Line Project Study Area

Species Name	Sensitive Status	Habitat Affinity	Potential for Occurrence
Plants			
Pygmy Sagebrush (*Artemisia pygmaea*)	CNHP: G4; S1	Shrublands, occurs in black sagebrush, rabbitbrush, shadscale, greasewood, juniper, pinyon-juniper, and ponderosa pine communities.	Reported from San Miguel County by the CNHP, this species would have a high potential for occurrence in the sagebrush, pinyon-juniper, and ponderosa pine communities within the study area.
Naturita Milkvetch (*Astragalus naturitensis*)	BLM: SS CNHP: G2G3; S2S3	Occurs on sandstone mesas, ledges, crevices and slopes in pinyon-juniper woodlands. Occurs mostly along McElmo Creek, and the San Miguel and Dolores rivers.	This species is known to occur in Mailbox Park, and there is high potential for it to occur in pinon/juniper communities with thin sandstone derived soils.
Wetherill Milkvetch (*Astragalus wetherillii*)	BLM: SS CNHP: G3; S3	Pinyon-juniper and sagebrush communities on steep slopes, canyon benches, and talus under cliffs on sandy clay soils derived from shale or sandstone.	Though there are no known occurrences within the vicinity of the study area, this species would have a moderate to high potential for occurrence within the pinyon-juniper woodlands in the western portion of the study area.
Pale Moonwort (*Botrychium pallidum*)	USFS: SS CNHP: G2; S2	Open exposed hillsides, burned or cleared areas, old mining sites and also subalpine meadows and montane forests.	This species is reported from the vicinity of Cropsey Mill near Telluride, and is expected to occur within the study area.
Weak-stemmed Mariposa Lily (*Calochortus flexuosus*)	CNHP: G4; S1	Desert flats and pinyon-juniper woodlands.	This species would have a moderate to high potential for occurrence within the pinyon-juniper woodlands in the western portion of the study area.
Slender Rock-brake (*Cryptogramma stelleri*)	CNHP: G5; S2	Crevices of limestone cliffs, moist shaded outcrops, extremely rare.	This species would have a moderate to high potential for occurrence on rock outcrops throughout the study area.
Showy Whitlow-grass (*Draba spectabilis* var. *oxyloba*)	CNHP: G3T3Q; S3	Mountain brush, white fir, ponderosa pine, spruce-fir, and alpine tundra communities, montane to alpine in southwestern counties in Colorado.	This species would have a moderate to high potential for occurrence within the montane shrub and forest communities within the eastern portion of the study area.
Altai Cottongrass (*Eriophorum altaicum* var. *neogaeum*)	USFS: SS CNHP: G4T?; S2	Peat wetlands high in southwestern mountains in Colorado, in fens in the high Elk and San Juan Mountains.	This species is reported from a peat bog near Prospect Hill near Telluride. This species is expected to occur within the study area.
Payson Lupine (*Lupinus crassus*)	BLM: SS CNHP: G2; S2	Endemic to Montrose County in pinyon-juniper woodlands or clay barrens derived from Chinle or Mancos Formation shales.	A population of this species is known from the study area near Naturita Creek near the Hwy. 145 bridge. This species would have a high potential for occurrence elsewhere within the pinyon-juniper woodlands of the study area.
Paradox Breadroot (*Pediomelum aromaticum*)	BLM: SS CNHP: G3; S2	Adobe hills in Mesa and Montrose counties, infrequent.	Basically a Paradox basin endemic, this species would have a low to moderate potential for occurrence in the pinyon-juniper woodland and shrub communities in the far western portion of the study area.

Table B-11
Other Special-Status Plant and Animal Species Occurring Or Potentially Occurring Within the Nucla-Telluride Transmission Line Project Study Area

Species Name	Sensitive Status	Habitat Affinity	Potential for Occurrence
Little Penstemon (*Penstemon breviculus*)	CNHP: G3Q; S2	Shadscale, rabbitbrush, sagebrush, pinyon-juniper communities, on sandstone and shale, in clayey loam soils in Montrose, Montezuma and San Miguel counties.	This species would have a low potential for occurrence in the shrub communities and pinyon-juniper woodlands of the western portion of the study area.
Abajo Penstemon (*Penstemon lentus*)	CNHP: G4Q; S2	A Colorado Plateau endemic, this species occurs in sagebrush, pinyon-juniper mountain brush and ponderosa pine communities.	This species is known from south of the study area and would have a moderate to high potential for occurrence in the shrub and woodland communities in the eastern portion of the study area.
Canyon Bog-orchid (*Platanthera sparsiflora* var. *ensifolia*)	CNHP: G4G5T3; S2	Moist, wet meadows, bogs, seeps, or along streams in poplar, mahogany, juniper aspen, ponderosa pine, lodgepole pine, spruce-fir communities.	This species is known from along the banks of the South Fork of the San Miguel River, just south of the Sunshine Substation. This species would have a moderate to high potential for occurrence elsewhere along streams in the montane forest communities of the eastern portion of the study area.
Altai Chickweed (*Stellaria irrigua*)	CNHP: G4?; S2	Locally common on screes at high altitudes.	This species has a low to moderate potential for occurrence within the montane forests in the eastern portion of the study area.
Invertebrates			
Sister (*Adelpha bredowii*)	CNHP: G4G5; S3	Oak woodlands and riparian areas.	May occur. Suitable habitat may exist up to 8,000 feet in oak woodlands and canyon riparian zones.
Great Purple Hairstreak (*Atlides halesus*)	CNHP: G5; S2	Pinyon-juniper and oak woodlands.	May occur. Suitable habitat may exist up to 6,000 feet. This species is associated with oak and juniper mistletoe.
Edith's Copper (*Lycaena editha*)	CNHP: G5; S2S3	Mesic meadows and roadside ditches in open forests.	May occur. Suitable habitat may exist in moist meadows or roadside ditches in open forests.
Two-banded Skipper (*Pyrgus ruralis*)	CNHP: G4; S3	Open meadows.	May occur. Suitable habitat may exist in moist open meadows associated with *Potentilla* sp.
Great Basin Silverspot (*Spreyeria nokomis nokomis*)	BLM: SS CNHP: G4T2, S1	Mesic meadows.	This species historically occurred in Paradox Valley but the occurrence has not been relocated. Though suitable habitat may exist in riparian areas such as moist meadows near streams, permanent spring-fed meadows, or seeps, this species is unlikely to occur within the study area.
Fish			
Bluehead Sucker (*Catostomus discobolus*)	BLM: SS CDOW: SC	Aquatic	Not known to occur. Suitable habitat may exist at the confluence of the Dolores and San Miguel rivers.
Flannelmouth Sucker (*Catostomus latipinnis*)	BLM: SS CDOW: SC CNHP: G3G4; S3S4	Aquatic	Not known to occur. Suitable habitat may exist at the confluence of the Dolores and San Miguel rivers.

Table B-11
Other Special-Status Plant and Animal Species Occurring Or Potentially Occurring Within the Nucla-Telluride Transmission Line Project Study Area

Species Name	Sensitive Status	Habitat Affinity	Potential for Occurrence
Roundtail Chub (*Gila robusta*)	BLM: SS CDOW: SC CNHP: G2G3; S2	Aquatic	Not known to occur. Populations known to occur in the Dolores and lower San Miguel rivers.
Rainbow Trout (*Salmo gairdneri*)	USFS: MIS	Aquatic	Known to occur in upper San Miguel River and tributaries.
Brown Trout (*Salmo trutta*)	USFS: MIS	Aquatic	Known to occur in upper San Miguel River and tributaries.
Colorado River Cutthroat Trout (*Oncorhynchus clarki pleuriticus*)	USFS: SS CDOW: SC CNHP: G5T3; S3	Aquatic	This species is known from Elk Creek near the Wilson Mesa Substation and also from Deep Creek. Suitable habitat may exist at higher elevations outside the project area in streams with natural barriers.
Amphibians			
Tiger Salamander (*Ambystoma tigrinum*)	USFS: SS CNHP: G5T40; S2	Aquatic	This species is common throughout the study area. Suitable habitat exists in stock ponds, irrigation ditches, and riparian zones in all habitats.
Northern Leopard Frog (*Rana pipiens*)	USFS: SS CDOW: SC BLM: SS CNHP: G5; S3	Aquatic	May occur. Suitable habitat exists in permanent pools and streams.
Reptiles			
Utah Milk Snake (*Lampropeltis triangulum taylori*)	CNHP: G5T4Q; S2	Rangelands, woodlands, riparian, coniferous forests.	May occur. Suitable habitat may exist in lower elevations of the project area in ponderosa pine, woodlands, rangelands or riparian areas.
Midget Faded Rattlesnake (*Crotalus viridis concolor*)	CDOW: SC BLM: SS CNHP: G5T4; S3	Rangelands, woodlands, riparian, coniferous forests.	May occur. Suitable habitat may exist in rangelands, wood-lands, riparian, or open coniferous forests up to 9,500 feet.
Birds			
American Peregrine Falcon (*Falco peregrinus anatum*)	USFS:SS, MIS CDOW:T CNHP: G4T4; S2B, SZN	Nests on rocky, sheer cliffs. Forages in open and wooded areas.	This species nests in the Dolores River Canyon, and some foraging within the project area is possible. Most peregrines within the project area are likely to be migrants.
Northern Goshawk (*Accipiter gentilis*)	USFS: SS, MIS BLM: SS CNHP: G5; S3B,SZN	Montane coniferous and aspen forests.	May occur. Suitable habitat may exist in mature aspen, aspen-spruce-fir, and ponderosa pine forests.

Table B-11
Other Special-Status Plant and Animal Species Occurring Or Potentially Occurring Within the Nucla-Telluride Transmission Line Project Study Area

Species Name	Sensitive Status	Habitat Affinity	Potential for Occurrence
Boreal Owl (*Aegolius funereus*)	USFS: SS CNHP: G5; S2	Montane and sub-alpine coniferous forests.	Breeding records exist from areas surrounding the project area including Turkey Creek south of Telluride, the Lone Cone area, and the Uncompahgre Plateau. Suitable habitat may exist in mature spruce-fir forests at upper elevations of the project study area.
Golden Eagle (*Aquila chrysaetos*)	CNHP: G5; S3S4B, S4N	Foraging habitat in rangelands, woodlands and coniferous forests. Nesting habitat occurs on cliffs.	Known to occur. Suitable foraging habitat exists in rangelands, woodlands, and ponderosa pine forests. Nesting habitat may exist on cliffs, or in snags in riparian or coniferous forests.
Long-eared Owl (*Asio otus*)	CNHP: G5; S3S4B,S2Z	Rangelands, shrublands, woodlands.	Known to occur. Suitable foraging habitat exists in rangelands, and nesting habitat exists in dense shrub or tree stands at rangeland margins.
Ferruginous Hawk (*Buteo regalis*)	USFS: SS BLM: SS CDOW: SC CNHP: G4; S3B, S4N	Grasslands	This species is a migrant within the study area but is not a permanent resident. Suitable habitat may exist in grasslands.
Olive-sided Flycatcher (*Contopus borealis*)	USFS: SS CNHP: G5, S3S4B	Douglas fir and upper elevation riparian forests.	Known to occur. Suitable habitat may exist in mature Douglas fir stands and upper elevation forested riparian areas.
Grace's Warbler (*Dendroica graciae*)	CNHP: G5; S3B, SZN	Ponderosa pine forests.	Known to occur. Suitable habitat exists in ponderosa pine forests.
Loggerhead Shrike (*Lanius ludovicianus*)	USFS: SS CNHP: G5; S3S4B, S2N	Shrublands and pinyon-juniper woodlands.	Known to occur. Suitable habitat exists in shrublands and pinyon-juniper woodlands.
Lewis' Woodpecker (*Melanerpes lewis*)	USFS: SS, MIS CNHP: G5, S3S4	Cottonwood riparian and ponderosa pine forests.	Known to occur. Suitable habitat may exist in lowland cottonwood riparian zones and open ponderosa pine forests.
Hairy Woodpecker (*Picoides tridactylus*)	USFS: MIS	Aspen, riparian, coniferous forest	Known to occur.
Red Crossbill (*Loxia curvirostra*)	USFS: MIS	Conifers including Douglas fir, Ponderosa pine, Englemann spruce	Known to occur.
Pinyon Jay (*Gymnorhinus cyanocephalus*)	USFS: MIS	Pinyon-juniper, adjacent sagebrush and open rangelands	Known to occur.
Long-billed Curlew (*Numenius americanus*)	USFS: SS BLM: SS CDOW: SC CNHP: G5; S2B,SZN	Riparian	May occur as a migrant. Suitable habitat may exist in riparian areas at reservoirs or the San Miguel River.
Flammulated Owl (*Otus flammeolus*)	USFS: SS	Ponderosa pine and aspen forests.	Known to occur near Naturita Creek. Suitable nesting habitat exists in ponderosa pine and aspen forests.
Osprey (*Pandion haliaetus*)	USFS: SS CNHP: G5; S3B, SZN	Large reservoirs and rivers.	May occur as a migrant. Suitable habitat may exist at large reservoirs or the San Miguel River.

Table B-11
Other Special-Status Plant and Animal Species Occurring Or Potentially Occurring Within the Nucla-Telluride Transmission Line Project Study Area

Species Name	Sensitive Status	Habitat Affinity	Potential for Occurrence
Fox Sparrow (*Passerella iliaca*)	USFS: SS	Riparian	Known to occur. Suitable nesting habitat exists in dense willows of riparian zones along the San Miguel River and its tributaries.
Northern Three-toed Wood-pecker (*Picoides tridactylus*)	USFS: SS CNHP: G5, S3S4	Montane and sub-alpine spruce-fir forests.	May occur. Suitable habitat may exist in mature spruce-fir forests at upper elevations.
White-faced Ibis (*Plegadis chihi*)	USFS: SS BLM: SS CNHP: G5; S2B, SZN	Riparian	May occur as migrants. Suitable habitat may exist in riparian areas at large reservoirs or the San Miguel River.
Purple Martin (*Progne subis*)	USFS: SS CNHP: G5; S3B, SZN	Rangelands with aspens	A colony of this species is known to occur near Gurley Reservoir. Suitable habitat exists in rangeland areas mixed with aspen stands.
Golden-crowned Kinglet (*Regulus satrapa*)	USFS: SS	Pinyon-juniper woodlands, ponderosa pine and spruce-fir forests.	May occur. Suitable nesting habitat exists in higher elevation mature spruce-fir forests. Winter habitat exists in ponderosa pine or pinyon-juniper woodlands.
Pygmy Nuthatch (*Sitta pygmaea*)	USFS: SS	Ponderosa pine forests.	Known to occur. Suitable habitat exists in ponderosa pine forests.
Mammals			
White-tailed Antelope Squirrel Subsp.(*Ammospermophilus leucurus cinnamomeus*)	CNHP: G5T4T5; S3	Rangelands and woodlands.	May occur. Suitable habitat may exist in rangelands and woodlands up to 7,000 feet.
Ringtail (*Bassariscus astutus*)	USFS: SS	Rocky canyons within rangeland, shrubland, oak wood-land, and pinyon-juniper woodland habitats.	Known to occur. Suitable habitat exists in rocky canyons within rangeland, shrubland, oak woodland, and pinyon-juniper woodland habitats.
Elk (*Cervus elaphus*)	USFS: MIS	Summer habitat is all forest types and adjacent range-lands; in winter use mid to a lower elevational shrub-lands, pinyon-juniper woodlands, rangelands, and agriculture areas.	Known to occur. Seasonal concentration areas identified throughout the study area.
Townsend's Big-eared Bat (*Corynorhinus townsendii*)	USFS: SS BLM: SS CNHP: G4, S2	Buildings, caves, or mines in rangeland, shrubland, or pinyon-juniper habitats.	May occur. Suitable habitat may exist in buildings, caves, or mines in rangeland, shrubland, or pinyon-juniper habitats.
Ord's Kangaroo Rat Subsp. (*Dipodomys ordii nexilis*)	CNHP: G5T4T5; S3	Sparse rangelands.	May occur. Suitable habitat may exist in rangelands with sparse vegetation and sandy soils.
Spotted Bat (*Euderma maculatum*)	USFS: SS BLM: SS CNHP: G4, S2	Cliffs associated with woodlands and ponderosa pine near riparian areas.	Not known to occur. Suitable habitat may exist in cliffs associ-ated with woodlands and ponderosa pine near riparian areas.

Table B-11
Other Special-Status Plant and Animal Species Occurring Or Potentially Occurring Within the Nucla-Telluride Transmission Line Project Study Area

Species Name	Sensitive Status	Habitat Affinity	Potential for Occurrence
North American Wolverine (*Gulo gulo luscus*)	USFS: SS CDOW: E CNHP: G4; S1	Montane and sub-alpine coniferous forests.	May occur. Suitable habitat may exist at higher elevations in coniferous forests.
Northern River Otter (*Lutra canadensis*)	CDOW: E	Aquatic	Known to occur in the San Miguel River from the mouth of Beaver Creek west.
Fringed-tailed Myotis (*Myotis thysanodes*)	USFS: SS BLM: SS CNHP: G5, S3	Woodland habitats associated with riparian zones.	May occur. Suitable habitat may exist in woodland habitats associated with riparian zones.
Yuma Myotis (*Myotis yumanensis*)	BLM: SS CNHP: G5, S3	Woodland and riparian habitats.	May occur. Suitable habitat may exist in woodland habitats and riparian zones.
White-throated Woodrat Subsp. (*Neotoma albigula brevicauda*)	CNHP: G5T2;S2	Canyons of shrublands and woodlands.	Known to occur. Suitable habitat exists in canyons of shrublands and woodlands up to 7,000 feet.
Mule Deer (*Odocoileus hemionus*)	USFS: MIS	Rangeland, woodland, forest and riparian zones.	Known to occur. Suitable habitat occurs throughout the project study area in rangeland, woodland, forest and riparian zones.
Dwarf Shrew (*Sorex nanus*)	USFS: SS CNHP: G4, S2S3	Rocky areas, wet meadows, and coniferous forests	May occur. Suitable habitat may exist in rocky areas, wet meadows, and coniferous forests.
Black Bear (*Ursus americanus*)	USFS: MIS	Rangeland, woodland, forest, and riparian communities	Known to occur. Suitable habitat exists in rangeland, woodland, forest, and riparian communities throughout the project study area.
Abert's squirrel (*Sciurus aberti*)	USFS: MIS	Mature Ponderosa pine communities	Known to occur. South of Norwood.
American Marten (*Martes americana*)	USFS: MIS	Dense conifers above 9,000 feet.	Known to occur. Eastern end of project area.

[1] **Status Codes:**

Federal Agency:

U.S. Fish and Wildlife Service (USFWS): LE - Listed Endangered; LT - Listed Threatened; C - Candidate for listing

Bureau of Land Management (BLM), Colorado

SS - Sensitive Species: those species found on public lands, designated by a State Director, that could easily become endangered or extinct in a state. The protection provided for sensitive species is the same as that provided for Candidate species.

U.S. Forest Service (USFS), Region 2

SS - Sensitive Species: those plant and animal species identified by the Regional Forester for which population viability is a concern as evidenced by: (a) Significant current or predicted downward trends in population numbers or density; and/or (b) Significant current or predicted downward trends in habitat capability that would reduce a species' existing distribution.

MIS – Management Indicator Species: species of management concern to USFS as specified in the Grand Mesa, Uncompahgre, and Gunnison National Forests Land and Resource Management Plan and the National Forest Management Act.

State:

Colorado Division of Wildlife (CDW): SE - Endangered; ST - Threatened; SC - Species of Special Concern

Table B-11
Other Special-Status Plant and Animal Species Occurring Or Potentially Occurring Within the Nucla-Telluride Transmission Line Project Study Area

Species Name	Sensitive Status	Habitat Affinity	Potential for Occurrence

Other:
Colorado Natural Heritage Program (CNHP):

Global Rarity Ranking is based on the range-wide status of a species.

- G1 - Critically imperiled globally because of extreme rarity (5 or fewer occurrences, or very few remaining individuals), or because of some factor of its biology making it especially vulnerable to extinction. (Critically endangered throughout its range).
- G2 - Imperiled globally because of rarity (6 to 20 occurrences), or because of other factors demonstrably making it very vulnerable to extinction throughout its range. (Endangered throughout its range).
- G3 - Very rare or local throughout its range or found locally in a restricted range (21 to 100 occurrences). (Threatened throughout its range).
- G4 - Apparently secure globally, though it might be quite rare in parts of its range, especially at the periphery.
- G5 - Demonstrably secure globally, though it may be quite rare in parts of its range, especially at the periphery.
- G#? Indicates uncertainty about an assigned global rank.
- GQ Indicates uncertainty about taxonomic status.
- G#T# Trinomial rank (T) is used for subspecies or varieties. These taxa are ranked on the same criteria as G1-G5.

State Rarity Ranking is based on the status of a species (relative abundance of individuals) in each state.

- S1 - Critically imperiled in state because of extreme rarity (5 or fewer occurrences, or very few remaining individuals), or because of some factor of its biology making it especially vulnerable to extirpation from the state. (Critically endangered in state).
- S2 - Imperiled in state because of rarity (6 to 20 occurrences), or because of other factors demonstrably making it very vulnerable to extirpation from the state. (Endangered or threatened in state).
- S3 - Rare in state (21 to 100 occurrences).
- S#B - Refers to the breeding season imperilment of elements that are not permanent residents.
- S#N - Refers to the non-breeding season imperilment of elements that are not permanent residents. Where no consistent location can be discerned for migrants or non-breeding populations, a rank of SZN is used.
- SZ - Migrant whose occurrences are too irregular, transitory, and/or dispersed to be reliably identified, mapped, and protected.
- SX - Presumed extirpated from the state.
- SU - Unable to assign rarity rank, often because of low search effort or cryptic nature of the element.
- SR - Reported to occur in the state, but unverified.
- S3S4 - Watchlisted. Specific occurrence data are collected and periodically analyzed to determine whether more active tracking is warranted. Watchlisted species are indicated in this document with " * ".

Sources:

U.S. Department of Agriculture, Forest Service. 1998. Letter dated February 11 from Richard Cook, District Ranger, Norwood, Colorado to Chris Keller, View Point West, Montrose, Colorado. Subject: Federally-listed and candidate

U.S. Department of Interior, Bureau of Land Management. 1998. Letter dated September 23 from Ann Morgan, State Director, Colorado to District and Area Managers. Subject: State Director's Sensitive Species List.

Colorado Native Plant Society. 1997. Rare plants of Colorado. Falcon Press Publishing Company, Helena, Montana and Rocky Mountain Nature Association, Estes Park, Colorado. 105 pages.

Colorado Natural Heritage Program. 1997. Colorado's natural heritage: rare and imperiled animals, plants, and plant communities. Colorado Natural Heritage Program. 71 pages+.

APPENDIX C

ELECTRICAL CHARACTERISTICS
NUCLA-TELLURIDE TRANSMISSION LINE

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July 1999, revised October 2001

APPENDIX C - ELECTRICAL CHARACTERISTICS

1.0 Line Characteristics

Both current and voltage are required to transmit electrical energy over a transmission line. The current is a flow of electrons measured in amperes or amps (A) and is the source of a magnetic field. The voltage is expressed in units of volts (V) and is the source of an electric field. The proposed Nucla-Telluride Transmission Line is a 115 kilovolts (kV) line. At maximum capacity, approximately 282 amperes (A) could flow in each of the three phases. Under normal operating conditions, the average current flowing in each phase conductor will be 150 A.

The proposed construction approach for the Nucla-Telluride Transmission project consists of a new 115 kV transmission line, H-frame construction with the three-phase conductors suspended from a horizontal cross arm. Along sections of the route, the line will be constructed on a single pole with the conductors arranged in a delta configuration. Both designs were modeled for the electric fields, magnetic fields, and corona discharge generated. Analysis of the electrical characteristic of the proposed Nucla-Telluride Transmission Line was also conducted for both designs. Calculations of the electric and magnetic fields from the proposed lines were performed using the FIELDS® computer program (Southern California Edison 1994). The corona calculations were made using the Corona and Field Effects Program, Version 3 (Bonneville Power Administration 1991).

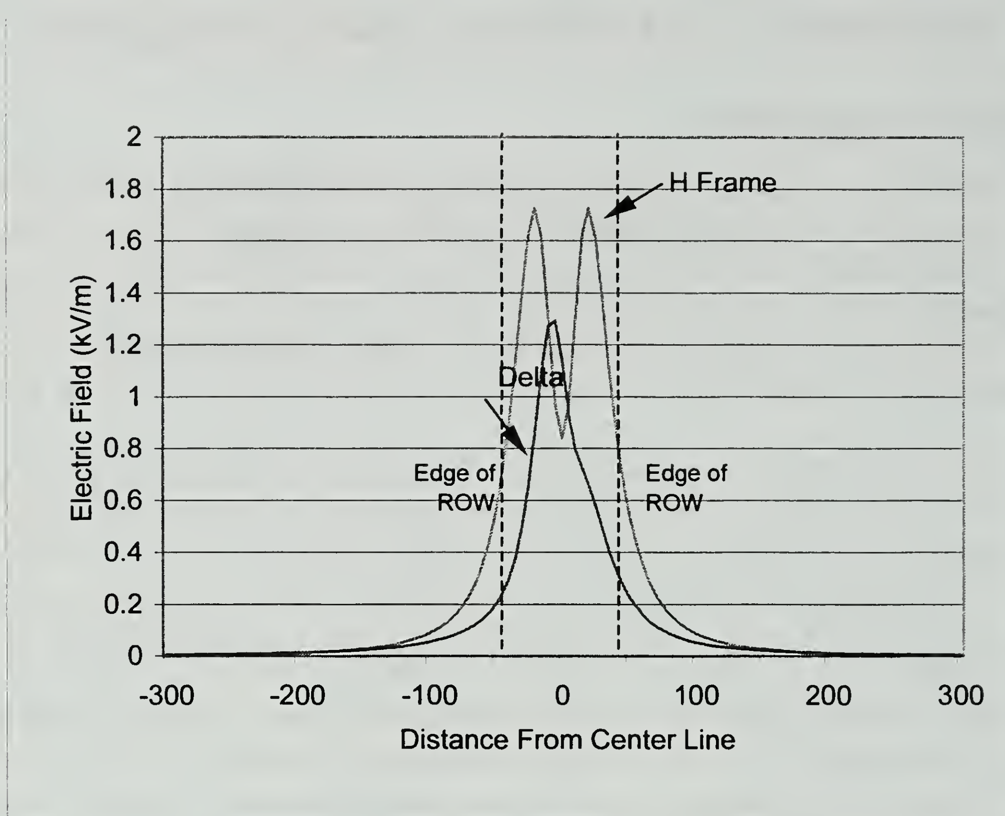
2.0 Electric and Magnetic Fields

2.1 Electric Field

The electric field created by a power line exists in the region around the energized conductors. The electric field or voltage gradient is expressed in units of volts per meter (v/m) or kilovolts per meter (kV/m). The unperturbed electric field at a height of three feet is used to describe the field near transmission lines. This quantity is easily measured and computed.

Construction and operation of this line must comply with the National Electrical Safety Code (NESC). NESC states the condition for evaluating currents induced by electric fields is with the conductors at a temperature of 120EF and at a final conductor sag. The computed electric field profiles at 3.3 feet above ground for the proposed conductor configuration is shown in Figure C-1. The maximum field directly under the line with minimum 24-foot ground clearance ranges from 1.3 to 1.7 kV/m for the two designs.

Figure C-1 Electric Field Plots for H Frame and Delta Configurations



2.1.1 Induced Currents

When a conducting object is placed in an electric field, currents and voltages are induced in the object. The magnitude of the induced current depends on the electric field strength and the size and shape of the object. If the object is grounded, then the induced current flows to earth and is called the short-circuit current of the object. In this case, the voltage on the object is effectively zero. If the object is insulated (not grounded), then it assumes some voltage relative to ground. These induced currents and voltages could represent a potential source of nuisance shocks near a high voltage transmission line.

With the conductor at 120°F, and 24-foot ground clearance peak electric field of 1.7 kV/m, the short-circuit current to the largest anticipated vehicle is approximately 1.6 mA, which is much less than the NESC criterion of 5 mA. Large pieces of farm equipment such as hay wagons and combines would have large short-circuit currents but would not exceed this level. The possibility of the total short-circuit current being available for a shock is further diminished by less than ideal conditions such as conducting tires, vegetation touching the vehicle, moisture, etc.

2.1.2 Steady-state Induced Current

Steady-state currents are those that flow continuously after a person contacts an object and provides a path to ground for the induced current. The response of persons to such currents has been extensively studied and levels of human response documented (Keesey 1969; IEEE 1978). Primary shocks are those that can result in direct physiological harm. The lowest category of primary shocks is "let go," which represents the steady-state current that cannot be released voluntarily. The let-go threshold was established at 9.0 mA for adult males weighing 180 pounds and 6.0 mA for adult females weighing 120 pounds. Let-go thresholds for adults have been established from actual experimentation. The derivation of a threshold for children based on these adult levels was based on body weight, and is generally accepted as 5.0 mA (the value

adopted by the NESC). Primary shocks will not be possible from the induced currents under the proposed Nucla-Telluride Line because of the line"s relatively low field strengths and the grounding practices that will be used.

The maximum induced current criterion for a vehicle is 5 mA. Potential steady-state current from vehicles under the proposed Nucla-Telluride Line would be below the secondary shock level, where secondary shocks are defined as those that could cause an involuntary and potentially harmful movement but cause no direct physiological harm.

Several factors tend to reduce the opportunity for secondary shocks to occur. If activities are distributed over the whole right-of-way, then only a small percentage of time will be spent in areas where the field is at or close to the maximum value. If road crossings are kept near the towers (where conductors are highest), the vehicular traffic in high-field-strength areas (where conductors are lowest) will be restricted to farm machinery on soil or vegetation, which tend to reduce shock currents substantially.

Because of these mitigating factors, most steady-state current shocks will be below the 1.1 mA perception level for 50% of men and, in fact, less than the 0.5 mA standard for maximum leakage current from portable appliances. These steady-state current shocks are not anticipated often, and when they occur they will represent more of a nuisance rather than a hazard.

2.1.3 Spark Discharge Shocks

Induced voltages appear on objects such as vehicles when there is an inadequate ground. If the voltage is sufficiently high, then a spark discharge shock will occur as contact is made with the object. Such shocks are similar to "carpet" shocks, which occur when touching a door knob after walking across a carpet on a dry day. Spark discharge shocks could occur under the Nucla-Telluride Line. The magnitude of the electric field will be low enough so that this type of shock would occur rarely and then only in a small area under the line near mid-span.

Carrying or handling conducting objects under the line can also result in spark discharges that are a nuisance. Irrigation pipe should be carried as low to the ground as possible and preferably unloaded at a distance from the transmission line to eliminate spark discharge nuisance shocks. The primary hazard with irrigation pipe is direct contact with the conductors.

2.1.4 Field Perception

When the electric field under a transmission line is sufficiently great, it can be perceived by hair erection on an upraised hand with the sensation of a slight breeze blowing over the hand or arm. It is very unlikely that the electric field under the Nucla-Telluride Line would be perceivable when standing on the ground. When working on top of equipment, there is probably enough extraneous skin stimulation during normal activities to preclude perception of the field at all.

2.1.5 Grounding and Shielding

Normal grounding policies effectively mitigate the possibility of nuisance shocks due to induced currents from stationary objects such as fences and buildings. Since the electric field extends beyond the right-of-way, grounding requirements extend beyond the right-of-way for very large objects or extremely long fences. Electric fences require a special grounding technique because they can only operate if they are insulated. Applying the grounding policy during and after construction will effectively mitigate the potential for shocks from stationary objects near the proposed line.

Mobile objects such as vehicles and farm machinery cannot be grounded permanently like a fence or building. Limits to coupled currents to persons from such objects are accomplished in three ways. First, the NESC requires, and lines are designed such, that the conductor clearance for lines with voltage exceeding 169 kV results in an induced short-circuit current in the largest anticipated vehicle under the line of less than 5 mA. The proposed Nucla-Telluride Transmission Line will operate at a lower voltage, and the induced short-circuit current will be much less than 5 mA.

A second method to reduce potential currents to persons is through the intentional use of grounds. For example, a vehicle can drag either a chain or other conductor; a ground strap can be attached to the vehicle when it is stopped.

Third, the very nature of large vehicles and their use tends to provide some grounding and reduce the electrical resistance of the vehicle to ground. Tires tend to be conductive, farm machinery is usually in direct contact with the soil, and conducting vegetation is in contact with equipment. Because of these factors, the realization of a well-insulated (worst case) vehicle is a remote possibility.

Electric field conductive shielding can reduce the accompanying reduction in induced effects such as shocks. Persons inside a conducting vehicle cab or canopy will be shielded from the electric field. Similarly, a row of trees or a low voltage distribution line will reduce the field on the ground in their vicinity. Metal pipes, wiring, and other conductors in a residence or building will shield the interior from the electric field created by the transmission line.

Impacts of electric field coupling can be mitigated through grounding policies and by adhering to the NESC. Worst case levels are used for safety analysis; but, in practice, currents and voltages are reduced considerably by both intentional and inadvertent grounding. Shielding by conducting objects, such as vehicles and vegetation, also reduces the potential for electric field effects.

2.2 Magnetic Field

The engineering units for the magnetic field vector, H, are Amperes per meter (A/m). However, the most common units reported in the scientific literature to characterize the field are often the magnetic flux density, B, measured in units of Gauss. Because the Gauss is a relatively large quantity, the milligauss (mG) unit is often used (1 Gauss = 1000 mG, or 0.001 G = 1 mG). Some technical reports also use the Tesla (T) or microtesla (μT) to describe the magnetic flux density (1 mG = 0.1 μT = 0.0000001 T). Magnetic field values in this section are presented as magnetic flux density in units of mG.

The maximum calculated 60 Hz magnetic field on the right-of-way (directly under the line) during typical average load conditions for the proposed Nucla-Telluride 115 kV transmission line is approximately 39 mG for the H-frame configuration (Figure C-2). This field would occur with the conductors at or above 24 feet above ground level (at 120°F) and under normal loading conditions (150 A). For the delta configuration, the maximum magnetic field is 17 mG (Figure C-3). These expected levels are comparable with typical magnetic fields of other transmission lines and with levels of magnetic field measured close to some common household appliances, as shown on Table C-1 (Lee et al. 1985; Gauger 1985). At the right-of-way edge under these typical normal load conditions, the calculated magnetic field is approximately 4.5 mG for the H frame configuration and 1.8 mG with the delta configuration.

The actual level of magnetic field will vary with current loading, conductor temperature, and ground clearance. Under temporary peak loading, when conditions are expected to occur about one hour per year, the maximum calculated 60 Hz magnetic field would be 73 mG and the edge of right-of-way approximately 8.5 mG for the H-frame configuration (Figure C-2). For the delta configuration, the peak fields will be 32 mG and at the edge of ROW the peak field will be 3.8 mG (Figure C-3). The DC magnetic field of the earth is a static field that varies from 400 to 700 mG in various locations.

Impacts associated with magnetic fields from an AC transmission line include magnetically induced voltages and currents in long conducting objects, and possible biological effects created by long-term exposure to transmission line fields. The latter possibility is discussed in the section on long-term exposure to transmission line fields.

Figure H-2 Magnetic Fields for H-Frame Configuration

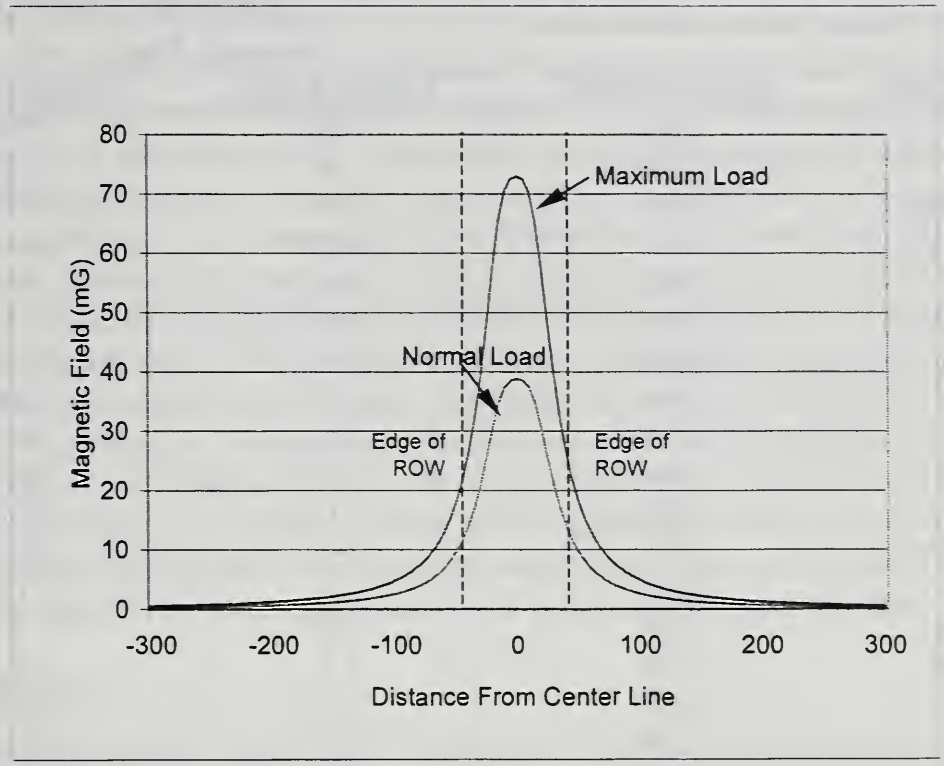


Figure H-3 Magnetic Fields for Delta Configuration

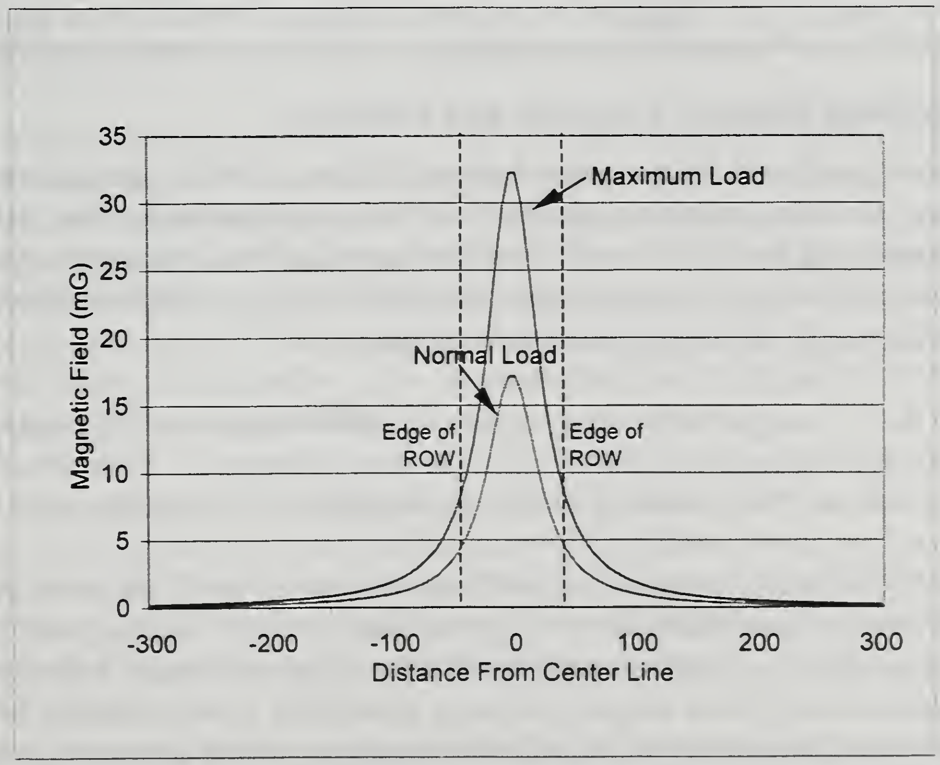


Table C-1. Magnetic Field Environment
Summary of Domestic Appliance Magnetic Field Measurements

Appliance Type	Body Location	Magnetic Field - mG Typical Range	Magnetic Field - mG Maximum Value
Range	Belt	1-80	175-625
Refrigerator	Chest	1-8	12-187
Microwave Oven	Belt	3-40	65-812
Can Opener	Belt	30-225	288-2750
Oven	Belt	1-8	14-67
Toaster	Belt	2-6	9
Coffee Maker	Chest	1-2	4-25
Freezer	Head	1-3	4-6
Mixer	Belt	2-11	16-387
Clothes Dryer	Belt	1-24	45-93
Dishwasher	Belt	1-15	28-712
Garbage Disposal	Belt	1-5	8-33
Ceiling Fan	Head	1-11	125
Electric Blanket	Belt	3-50	65
Waterbed Heater	Belt	1-9	20-27
Blow Dryer	Head	1-75	112-2125
Computer	Belt	1-25	49-1875
Typewriter	Belt	1-23	38
Make-up Mirror	Chest	1-29	44-125
Shaver	Head	50-300	500-6875
Aquarium	Belt	1-40	50-2000
Sewing Machine	Chest	1-23	26-1125
Electric Drill	Chest	56-194	300-1500
Circular Saw	Belt	19-48	84-562

2.3 Magnetically Induced Currents and Voltages

Alternating magnetic fields induce voltages at the open ends of conducting loops. Such things as a fence, an irrigation pipe, a pipeline, an electrical distribution line, or a telephone line can form the conducting loop. The earth to which one end of the conductor is grounded forms the other portion of the loop. The possibility for a shock exists if a person closes the loop at the open end by contacting both the ground and the conductor.

Shocks due to magnetically induced currents and voltages are the same type as dose-to-electric-field-induced currents and voltages. In the case of magnetic induction, the voltages are generally quite low, and the resistance in the current path limits the currents.

Normally, the resistance of shoes will limit the current to levels below the threshold for perception. However, a low resistance contact (standing barefoot on damp earth) with a long insulated fence parallel to a heavily loaded transmission line can result in steady-state currents above threshold and even above let-go. This latter possibility is very unlikely because of the line length of ungrounded fence required. Mitigation measures such as grounding and breaking electrical continuity that are implemented for electric field induction will also mitigate magnetic field induction effects.

Knowledge of the phenomenon, grounding practices, and the availability of mitigation measures mean that magnetic induction effects from the Nucla-Telluride Line can be minimized. It is, therefore, unlikely that magnetically induced voltages and currents would have an adverse impact.

3.0 Corona Characteristics

The electric field of a high voltage transmission line can cause corona to occur at sharp edges or points on the surface of the conductors, insulators, and hardware of the line. Corona represents a conversion of electrical energy into audible noise, electromagnetic interference with radio signals, visible light, and heat. Gas molecules near the conductors can be ionized resulting in photochemical oxidants such as ozone and oxides of nitrogen being produced. The intensity of the electric field at the surface of a conductor is the most important factor in determining the amount of corona. Electric field strength depends on the voltage and the size of the conductor, and is influenced by the altitude of the line above sea level. The smaller the radius of curvature of an object (i.e., if it has a sharp edge or point), the higher the electric field will be at the surface of the object for a given voltage. Corona on conductors occurs where protrusions such as nicks, insects, or water drops exist on the conductor. During fair weather, the number of these sources is small, and corona is very low. However, during rain, fog, and snow, the number of these sources increases substantially because of raindrops, snowflakes, and condensation on the surface of the conductors. Therefore, corona activity is greater during foul weather.

3.1 Audible Noise

Corona-generated audible noise from transmission lines is generally characterized as a crackling, hissing sound. The audible noise is most noticeable during wet conductor conditions such as rain, snow, or fog. Sometimes a 120 Hz hum is also present during foul weather. During fair weather, audible noise from transmission lines may be barely perceptible as a very sporadic cracking sound. Transmission line audible noise is measured and computed in units of sound decibels (A-weighted) or dBA. The A-weighted sound level scale weighs the various frequency components of a noise in the same way that the human ear responds. An increase of 3 dBA is usually perceived subjectively as "doubling" the loudness of the sound.

Some typical noise levels are: a library, 40 dBA; light automobile traffic at 100 feet, 50 dBA; an air conditioning unit at 20 feet, 60 dBA; and freeway traffic or a freight train at 50 feet, 70 dBA. The 70 dBA level represents the point at which a contribution to hearing impairment begins. Sleep disturbance occurs for steady noises above about 35 dBA at the location of the sleeping individual (Scott-Walton 1979). Continuous noise levels of 44 dBA do not interfere with normal conversation at up to 25 feet separation between individuals (Scott-Walton 1979). Noise decreases with distance, and outdoor noise is attenuated (i.e., reduced) with distance and when passing through objects such as buildings.

In most instances, the audible noise from the Nucla-Telluride Line would be masked by naturally occurring sounds at locations beyond the edge of the right-of-way, such as falling raindrops during a rainstorm. The attenuation associated with distance from the line and with passing through a building wall would reduce the maximum levels below the level that interference occurs with sleep, conversation, or television viewing.

Transmission line noise is commonly expressed in terms of exceedance levels: for example, L50 refers to the noise level in dBA that are exceeded 50% of the time. Separate exceedance levels are given for rain and fair weather. The L50 rain level corresponds closely to an average value over all rains for a long period of time, usually one year. The overall average noise level depends on the amount of rain or foul weather at a particular location. The Nucla-Telluride Line is located in an area of below average precipitation based upon national standards.

Predicted L50 audible noise levels for the edge of the right-of-way during rain for the proposed 115 kV line configuration's noise levels are expected to be 12 dBA at the edge of the right-of-way. During this rain event, the audible noise from the transmission line would probably be masked by the noise from the falling raindrops outside of the right-of-way. The predicted average (L50) fair weather noise level at the edge of the right-of-way is approximately 0 dBA, depending on elevation. These levels would most likely be below ambient (existing) noise levels.

3.2 Radio and Television Interference

Corona on transmission line conductors can generate noise at the frequencies at which radio and television signals are transmitted. This noise can interfere with receiving these signals and is called "radio interference" and "television interference," depending on the frequency. Radio reception in the AM broadcast band (535 to 1605 kHz) is most often affected with what is commonly referred to as static. FM radio reception is rarely affected. Only radio receivers very near to transmission lines have the potential to be affected by radio interference. An acceptable level of maximum fair weather radio interference at the edge of a right-of-way is 40 to 45 dBmV/m (decibels above 1 microvolt per meter). Average levels during foul weather are, as a general rule, 15 to 22 dB higher than average fair weather levels.

The predicted rain and fair weather radio interference levels (at a frequency of 1 mHz) for the proposed Nucla-Telluride Line is approximately 18.3 dB during rain, and 1.3 dB during fair weather. The levels are within acceptable guidelines. The expected television interference computed at 75 megahertz for the 115 kV line is -14.3 dB, which is also within acceptable guidelines. If radio interference generated by the proposed transmission line proves annoying in a given situation, mitigating techniques exist and will be applied on a case-by-case basis.

Another and more prevalent source of radio interference and television interference from electrical systems is spark gaps on distribution and low voltage transmission lines. If for some reason such as mechanical failure, vibration, or corrosion occurs, a connection between two parts that is usually conducting becomes nonconducting, then a voltage can develop across the gap between the two components. If the voltage is large enough, then a spark occurs, which generates radio interference, television interference, and, sometimes, audible noise. This type of interference is primarily a fair weather phenomenon. Water tends to short out the gaps during foul weather. Spark gaps mainly will occur more often on old lines where loose and damaged hardware and dirty insulators sometimes are present. Transmission line maintenance activities are intended to locate and correct these problems as they occur. New lines are designed with large radius fittings to reduce corona and gap-free hardware.

Corona can affect the reception of the video (picture) portion of a TV signal. Television interference due to corona appears as three bands of "snow" on the television screen. Television interference at the edge of the right-of-way due to corona occurs during foul weather and is generally of concern only for transmission lines with voltages of 345 kV or above.

As with radio interference, gap sources on distribution and low voltage transmission lines are the principal source of television interference. The proposed 115 kV line would be designed to minimize such sources of television interference. Other forms of television interference from transmission lines are signal reflection (ghosting) and signal blocking caused by the relative locations of the metal transmission conductors, and the receiving television antenna with respect to the incoming television signal.

In those instances where television reception is degraded by the line, mitigating techniques exist and will be applied on a case-by-case basis. Corona effects from all of the alternatives modeled are expected to be low enough so that no objectionable audible noise or radio or television interference will result outside the right-of-way.

3.3 Other Interference

Corona-generated interference usually does not cause disruption on other communication bands such as the citizens' (CB) and mobile bands because of the higher frequencies of these signals. Complaints of interference to CB radios are rare. A more likely cause of interference to CB is sparking on a transmission or distribution line. Mobile radio communications are not susceptible to transmission line interference because they are generally frequency modulated (FM). These FM signals would not be affected. In the unlikely event interference occurs with these or other communications, mitigation can be achieved with the same techniques utilized for TV and AM radio interference.

3.4 Visible Light

Corona can be dimly visible as a bluish glow or as bluish plumes. On the proposed line, corona on the conductors would be observable only under the darkest and/or rainiest conditions, when the corona is most intense, and probably would be visible only with the aid of binoculars. Without a period of adaptation for the eyes, and without intentionally looking for the corona, it would probably not be noticeable.

3.5 Photochemical Oxidants

When corona is present, the air surrounding the conductors is ionized and chemical reactions may take place producing extremely small amounts of ozone and other oxidants. Measurements in the laboratory and near transmission lines have shown that the amount of oxidants produced by operating transmission lines is usually not measurable and of no environmental consequence.

3.6 Ozone

Ozone is a colorless, unstable gas with a pungent odor. It can be measured in micrograms per cubic meter (μ/m^3) or parts per billion (ppb). Natural sources of ozone at ground level are diffusion from the stratosphere where ozone is formed by sunlight and production by electrical processes such as lightning. Photochemical oxidants that are formed by the action of sunlight on hydrocarbons and nitrogen oxides are another principal source of ambient ozone. Ozone sources are usually associated with human activities where combustion is involved (i.e., transportation and industrial processes in large urban areas).

The national primary ambient air quality standard for photochemical oxidants, of which ozone is the principal component, was recently changed by EPA to is 235 μ/m^3 or 80 ppb. This is an eight-hour average concentration not to be exceeded more than once per year. In rural areas, concentrations are usually in the range of 10 to 30 ppb, with higher levels present during the summer.

The maximum incremental ozone levels at ground level calculated for either the proposed or alternative conductor configurations of the proposed line would be less than approximately 0.016 ppb for a 1.0 mph perpendicular wind and a 0.05 inch per hour of rain. Because the

resolution of ozone instrumentation is approximately 1 ppb, it is very unlikely that corona-generated ozone from the proposed line could even be measured. Furthermore, the incremental levels of ozone predicted for this line are insignificant when compared to natural levels, fluctuations in natural levels, and air quality standards.

3.7 Nitrogen Oxides

Corona discharges from high voltage transmission lines can produce nitrogen oxides. However, studies conducted to determine the amount of nitrogen oxides produced show the amount produced is normally one-tenth the quantity of ozone produced. The maximum ground level concentration of nitrogen oxides produced by the proposed transmission line is expected to be negligible.

4.0 Long-term Exposure to Transmission Line Fields

The question of whether long-term direct exposure to the electric and magnetic fields from transmission lines cause biological or health effects in humans is a controversial subject. However, in no case has a specific deleterious effect to human health been identified from exposure to transmission line fields.

4.1 Electric Fields

Much of the concern and activity related to the question of long-term exposure effects was stimulated by reports from the Soviet Union in the early 1970s. These reports indicated that workers in substations with voltages greater than 600 kV were suffering from such debilitating effects as headaches, tiredness, nausea, loss of libido, and other functional disorders (Knickerbocker 1975). These effects were attributed to electric fields (greater than 5 kV/m). Subsequent studies in the United States and elsewhere have failed to substantiate the Soviet findings (as discussed by Michaelson 1979; Mehn 1979; Male and Norris 1981; Lee et al. 1985). Bridges (1978) evaluated the Soviet studies in terms of other environmental factors present in the substations and concluded that the electric field could not be solely identified as the causal agent of the reported effects.

More recently, Soviet papers have expressed reservations about the validity and extent of earlier reports of adverse effects (Savin et al. 1978; and Bourgsdorf 1980: cited in Male and Norris 1981).

The original impetus for concern has been tempered and the possibility of dramatic effects essentially eliminated. Over the past decade, research addressing the existence and implications of possible effects has been conducted with humans, animals, and cells and tissues. The results of this research and the question of possible health effects due to 60 Hz electric and magnetic fields have been analyzed and reviewed by numerous authors and scientific panels. Recent reviews of the literature and research related to possible health effects of 60 Hz electric and magnetic fields have been prepared by the World Health Organization (WHO 1984); American Institute of Biological Sciences (AIRS 1985); Florida Electric and Magnetic Fields Science Advisory Commission (FEMFSAC 1985); Western Energy Supply and Transmission Associates (WEST 1986); New York State Power Line Project (NYSPLP) (Ahlbom et al. 1987); Ontario Ministry of Health (Ontario 1987); and an Oak Ridge Associated Universities Panel (ORAU 1992).

These reviews were prepared by groups of scientists familiar with the scientific literature. Each group evaluated, wholly or in part, the results of epidemiologic studies, human laboratory studies, animal studies, and cell and tissue studies. Although the reviews addressed the electric and magnetic field bioeffects emphases, no panel of experts has ever concluded that the existence of adverse effects has been established.

A more recent occupational study (Miller et al. 1996) has reported an association between exposure to high electric fields and the occurrence of leukemia in electric utility linemen. This is the first study to report such an association. It should be noted that the study evaluated the risk of leukemia in a group of workers who were employed by Ontario Hydro in Canada. These same employees also were studied for their leukemia risk as a part of a larger study of electric utility workers in Ontario and Quebec, Canada, and in France (Theriault et al. 1994). The earlier study reported only a weak association with electric field exposure and leukemia across workers in all three utilities.

Although it is virtually impossible to demonstrate "no risk" from electric field exposures, the degree of uncertainty is continually reduced through research.

4.2 Magnetic Fields

Initially, concern and research about possible biological effects from 60 Hz fields focused on electric fields. Magnetic fields from transmission lines did not receive the same early emphasis as electric fields because:

Magnetic fields associated with transmission lines are at a low level compared to levels where effects have been observed, and magnetically induced currents are at levels 1,000 times less than endogenous levels in the body (FEMFSAC 1985);

Field levels in the home from appliances are comparable to or greater than those from transmission lines; and

Induced current densities from the peak magnetic fields under transmission lines are approximately an order of magnitude less than those from peak electrical fields (FEMFSAC 1985).

Thus, the relatively low level of induced currents from 60 Hz transmission line magnetic fields and the lack of significant amounts of magnetic material in any but specialized organisms make magnetic interaction with biologic material slight when compared with 60 Hz electric field interaction.

There are two basic, but fundamentally different, approaches to investigating environmental effects of agents on living organisms. The first approach involves laboratory studies either on intact, living organisms or on isolated cells growing in tissue culture. The second is the epidemiological approach of studying patterns of diseases in populations using statistics. The laboratory approach is more direct in that animals or cells are actually exposed to a known agent in a controlled laboratory setting, preferably over a considerable time period. Effects on cellular components, growth, reproduction, development, mortality, and other biological parameters are then evaluated.

4.3 Laboratory Studies

Studies on animals and cells in controlled laboratory settings have investigated a number of possible health parameters, including cellular genetics, reproduction, and development.

Cellular genetics studies are important in assessing the possible relationship of a particular agent to cancer or other health effects as might be suggested by epidemiologic studies. The discovery of DNA, the genetic material of cells, has brought a much fuller understanding of the processes by which environmental agents can affect health. It is now clear that chemical and other agents that damage DNA by breaking the molecular bonds between molecules have consistent effects on cells, tissues, and organisms. Such effects from certain environmental agents are seen at the cellular level and also affect fetal growth, development, and overall mortality. In addition, cancer, which is caused by alterations in DNA, can be and consistently is caused by those agents that damage DNA.

Molecular and cellular level studies show that power frequency fields produce no detectable changes in DNA (Reese et al. 1988). These findings of no cellular level effects on DNA have been confirmed in studies on fetal growth, development, and mortality and provide strong evidence that cancer causation (initiation, promotion and/or progress in) does not relate to the electric and/or magnetic fields in our everyday environment.

More recently, research looking at an effect of magnetic field exposure on specific genes of human leukemia cells has shown in one series of experiments an increase in the expression of such genes (Lin et al. 1993) when the cells are exposed to low level magnetic fields. More recent attempts to achieve these same results in similar experiments at other laboratories in Britain and in the United States have not succeeded (Saffer et al. 1994). Therefore, the original findings have yet to be confirmed by other investigators.

Extensive laboratory studies on animals have been conducted to assess whether power frequency electric and/or magnetic fields affect birth outcome, reproduction, growth, or development. In a study of electric fields, Graves et al. (1985) exposed thousands of chick embryos to power frequency electric fields ranging from 0.1 to 100 kV/m. The highest level of exposure was about 10 times the highest level found under any transmission line. The researchers found no effects on embryo mortality, malformations, growth, hatching or behavior, growth and development, or overall health of the animals.

In summary, it is now generally accepted that agents that cause cancer damage the genetic material of the cell, the DNA. Indeed, without alteration of the DNA, a cancer cell would not give rise to daughter cancer cells and tumors would not result. There is an abundance of scientific data that show no genetic damage in cells or tissues as a result of exposure to power frequency electric and/or magnetic fields.

Furthermore, carcinogens have effects that are not limited to the expression of cancer but also cause adverse effects on reproduction, pregnancy, fetal or embryo growth and development, on general health, and on mortality. There is now an abundance of studies that demonstrate no adverse effects on any of these indicators of health, even after generations of high levels of exposure to power frequency electric and/or magnetic fields.

4.4 Epidemiologic Studies

In recent years, there has been heightened concern about possible effects of prolonged

exposure to weak magnetic fields associated with residential and occupational exposure because of epidemiologic studies that have linked cancer, particularly in children, with magnetic fields. Certain reports have associated childhood cancers with residential magnetic field exposures. Similarly, other reports have associated increased incidence of certain types of cancer with "electrical worker" occupations, which purportedly have high magnetic field exposures when compared with other occupations. There are also contradictory or null reports of association with cancer in studies involving both residential and occupational exposure. Recent reviews of these studies include Tenforde (1986); WEST (1986); Ahlbom et al. (1987); and Savitz and Calle (1987).

4.4.1 Residential Studies

Both residential and occupational studies have examined associations between presumed exposure to power frequency fields and cancer. The results of the residential studies have been very inconsistent: some report a possible increased risk of cancer, others find no evidence of an increased risk, and still another study shows an inverse relationship with the risk of cancer *decreased* for individuals living in homes near power lines.

Wertheimer and Leeper (1979) first raised the possible association of childhood leukemia with magnetic fields. They observed a positive association between the electrical distribution system wiring in Denver, Colorado, and the incidence of childhood leukemia. They found that childhood cancer cases that resulted in death between 1950 and 1973 were more likely to live near high-current configurations (HCC) than near low-current configurations (LCC). HCCs are primary and secondary wiring configurations that have a larger conductor wire size and are assumed to carry more electric current and hence to be stronger sources of magnetic fields than LCCs. Also, HCC configurations are located closer to the houses of interest where the magnetic field from the power line would be greater. These configurations are proxy measurements of magnetic fields, and the Wertheimer-Leeper study was not based upon measurements of actual magnetic field exposure. The researchers concluded from their observations that an association exists between wiring configurations of residential distribution lines and childhood cancer. The cancer risk appeared to be two to three times greater for residences near HCCs. Wertheimer and Leeper (1982), in a second study in the Denver area, found an association of the incidence of adult cancer with HCCs. Both studies have been widely criticized because of problems in the methodologies and the analyses that were used (e.g., Miller 1980; Roth 1985).

Fulton et al. (1980) performed a similar study in Rhode Island but did not observe a statistically significant association between childhood cancer and wiring configuration. A more recent study in the Seattle area employing improved exposure characteristics found no association between measured magnetic fields or wiring codes and the incidence of adult leukemia (Stevens 1986). Tomenius et al. in 1982 (Tomenius 1986), measured magnetic field levels at the front door of residences of childhood tumor cases and matched controls in Stockholm, Sweden. The incidence of cancer was greater than expected in residences near 200 kV transmission lines and with measured fields of 3 mG or greater.

A more recent childhood cancer study was performed in the Denver area by Savitz et al. (1987a; 1987b; 1988). This work was part of the New York State Power Line Project (NYSPLP) and used both the Wertheimer-Leeper wiring codes and magnetic field measurements in the home as exposure indicators. Magnetic field measurements in residences were made in both a low power condition (MAGLO) with the major appliances and lights off and with the same sources turned on (MAGHI). The childhood cases were those diagnosed between 1976 and 1983 and were different from those in the previous Denver study (Wertheimer and Leeper 1979). Savitz et al. observed no statistically significant association between those measured field levels

and cancer occurrence. Savitz observed a slight association between total cancer cases and proximity to HCCs: a risk ratio of 1.53 was observed relative to non-HCC homes (i.e., the increased risk associated with HCCs was about 50 percent). When Savitz et al. compared cancer occurrence to only the extreme wiring configurations, Very High Current Configuration (VHCC) and buried, they found higher but less precise odds ratios of 2.3 for all childhood cancers, 2.9 for leukemias, and 3.3 for lymphomas.

As a result of the interest in the two Denver childhood epidemiologic studies, a study was conducted in Los Angeles by a team from the University of Southern California (London et al. 1991). This study was similar in many respects to the Savitz et al. study with a few important differences. They made both spot and 24-hour measurements of magnetic fields, and spot measurements of electric fields. These results were similar to Savitz in that they saw no clear association between measured field and cancer occurrence. They observed, similar to Savitz et al., a significant association between VHCC and buried with childhood leukemia, with an odds ratio of 2.15. They also evaluated several appliances used in the home and saw a significant association with black and white television sets and hair dryers.

One of the most recent childhood cancer studies to be published is by Feychting and Ahlbom in 1992. They evaluated childhood leukemia occurrence for children who lived within 300 meters of 220 and 400 kV transmission lines in Sweden during the period from 1960 through 1985. The magnetic field estimates were determined from calculations that related the recorded power flow on the transmission line in past years, the construction of the line, and the distance from the line to the residence. Feychting and Ahlbom found a relative risk of 2.7 for calculated average exposures of 2 mG and over from the transmission line and childhood leukemia. They found no significant association between historic fields from the transmission line and the occurring of childhood brain tumors. They also found no association between 24-hour measurements and cancer occurrence. They found no significant association with children living in multi-unit apartment buildings, just for children living in single family homes.

The Savitz et al., London et al., and Feychting studies share many common results. One of the most intriguing is the common observation of an association between cancer occurrence and the surrogate measures of magnetic field intensity, the wiring configuration. All studies, however, failed to observe an association between measured magnetic fields and cancer occurrence. This apparent discrepancy has been called the wire code paradox, which continues to create some uncertainty on the interpretation of the results of these studies.

The National Cancer Institute has published the results of a study in the *New England Journal of Medicine* (Linet et al. 1997). In this study, they evaluated 638 children who had contracted acute lymphoblastic leukemia (ALL), who were under 15 years of age, and who lived in nine Midwestern states. The children were compared to 620 controls for their exposure to time weighted magnetic fields and to wire code for their homes. The study found no association between ALL and magnetic fields or wire codes. This study is the most comprehensive one done of this subject to date. Many scientists and medical professionals view this as a definitive evaluation that magnetic fields and wire codes are not linked to ALL occurrence in children.

These results were also seen in a study just published in the *American Journal of Epidemiology* (McBride, et al. 1999). This study was performed by the British Colombia cancer agency in Canada. In this study performed in five Canadian provinces they studied 399 children ages 0 to 14 with leukemia matched to 399 controls. They evaluated the risk of leukemia for 48 hour average personal measured magnetic fields, wire codes and spot measurements made in

each child's residence. The study participants also measured magnetic fields with person dosimeters worn by the children. None of these factors were seen to be significantly associated with childhood leukemia in these children. This is the second large well conducted study that has shown no real concern that proximity power lines or exposure to power line levels of magnetic fields is a cause of childhood cancer.

Most recently, the results of a second Canadian study of childhood leukemia conducted in Southern Ontario have been published in a pair of papers (Green et al. 1999a and Green et al. 1999b). This study evaluated 201 cases age 0 to 14 years diagnosed with leukemia from 1985 to 1993 matched to 406 controls. The childrens'exposure to magnetic fields was measured using four different metrics: wire code, spot measurements, time weighted average fields all measured in and around the child's home and magnetic fields measured by a personal dosimeter that the child wore for 48 hours. In the first paper, the authors report the results of the in and around home measurements. The measurements were not significantly associated with cancer occurrence except for outside of the home perimeter measurements of magnetic fields for children age 6 and under. The association between wire code and leukemia occurrence was not significant.

In the second paper (Green et al, 1999b), the authors report a significant association with childhood leukemia occurrence for magnetic fields greater than 1.4 mG measured with the personal dosimeter in children under the age of 6. This result is somewhat imprecise, however, due the small number of children in this age category. This result is also in direct contrast to the results reported in the first Canadian study (McBride, et al. 1999).

Congress in 1992 passed the Energy Policy Act that established the EMF RAPID (EMF Research and Public Information Dissemination) program. EMF RAPID directed the Department of Energy to conduct research into the health effects of EMF. As part of EMF RAPID, Congress also asked The National Academy of Sciences (Academy) to review all of the literature on the subject of the possible health effects of residential exposure to electric and magnetic fields. The Academy formed a committee of distinguished scientists who examined over 500 published studies on the subject. Their interim report (National Research Council 1997) stated, "... the conclusion of the committee is that the current body of evidence does not show that exposure to [power frequency electric and magnetic] fields presents a human health hazard. Specifically, no conclusive and consistent evidence shows that exposures to residential electric and magnetic fields produce cancer, adverse neurobehavioral effects, or reproductive and development effects."

This same Academy committee has now released their final report (National Research Council 1999). In this final report, they further state "in view of the negative outcomes of EMF RAPID replication studies, it now appears even less likely that MF's [magnetic fields] in the normal domestic or occupational environment produce important health effects, including cancer."

Congress as a part of EMF RAPID also charged the United States National Institutes for Environmental Health Sciences (NIEAS) to also evaluate the possibility of human health effects from exposure to magnetic fields. Congress directed NIEHS to review the literature on this subject and prepare a report to Congress on the findings. This recently released report (NIEHS, 1999) states "the scientific evidence suggesting that ELF-EMF exposures pose any heath risk is weak."

In summary, the laboratory and epidemiologic evidence to date has provided no consistent and conclusive evidence of a health hazard to humans from being exposed to residential electric and magnetic fields from power lines or appliances.

4.4.2 Occupational Studies

During the past several years, there have been several epidemiologic reports showing an association between the incidence of adult leukemia or cancer and occupations that purportedly involve exposure to electric and magnetic fields, the so-called "electrical worker" categories. Milham (1982) reported an elevated number of leukemia deaths (36%) for workers in 10 electrical occupations in the state of Washington. Numerous surveys of other occupational populations have subsequently appeared with varying results. Savitz and Calle (1987) compiled data from 11 studies in which incidence of leukemia was investigated as a function of possible occupational exposure. These data sets included the original Milham data. Their intent was to assess the consistency of the data that suggested an increased risk of leukemia among electrical workers. The summary relative risk across all studies and all jobs was a modest 1.2 for leukemia and a higher 20 to 50% increase in risk for acute leukemia. However, they noted that the available data were not adequate to conclude that electric and magnetic field exposures are the source of the increased risk.

Savitz and Loomis (1995) published the evaluation of cancer occurrence in 20,733 workers in five electric utilities in the United States who had died from all causes. The study was based on estimated magnetic field exposure for several different job titles and evaluated the mortality due to several types of cancer observed in the electric company workers. He did not observe a significant increase in leukemia incidence but he did observe an increase of brain tumors (relative risk 1.5) in workers who had worked for five or more years as linemen or electricians. This is contrary to other recent studies. Workers in the highest exposure group had a relative risk of brain tumors of 2.3 to 2.5 when compared to the lowest exposure group.

All of these studies were well conducted, with one showing no significant results and the two others showing significant results in different areas. None of these studies confirmed positive findings of any of the others. When coupled with the earlier occupational studies, these studies lend no further clarification of whether exposure to magnetic fields in certain exposed workers leads to cancer occurrence.

The epidemiologic evidence from both residential and occupational studies for an association between electric and/or magnetic fields and cancer or the adverse effects on humans is inconclusive and does not demonstrate a causal link. As a result, the recommendation of one of the scientific bodies (NRC 1999) is for Congress to not fund further research into this issue.

4.5 Summary

Over most of the right-of-way, the electric field will be below the perception level for humans. Anticipated use of the right-of-way is transitory. Both electric and magnetic fields from the proposed line outside the right-of-way will be comparable or lower than to levels of magnetic fields measured close to some common household appliances. Operational experience over several decades with 230 kV and higher voltage transmission lines has indicated no adverse biological or health effects related to electric or magnetic field exposure. The current state of epidemiological and laboratory evidence is not sufficient to support a conclusion that the proposed transmission line poses any adverse health or biological effects. Therefore, the electric and magnetic fields of the Nucla-Telluride Transmission line are not anticipated to cause adverse health or biological effects.

5.0 Effects on Agriculture

5.1 Honeybees

When hives are placed in electric fields of 2 to 4 kV/m, behavioral effects can occur in honeybees. There are two simple solutions to the problem. One is to avoid keeping the bees in high field regions on transmission line rights-of-way, and the other is to place grounded metal cages or screens over the hives.

Any beekeepers with hives located on the final right-of-way of the proposed line will be advised of the possible adverse effects to bees and compensated fairly to assist in relocation of hives. The maximum fields beyond the right-of-way for the proposed line will not exceed the threshold levels where effect on bees has been observed. Therefore, there will be no impact beyond the right-of-way.

5.2 Crops

High electric fields (15 kV/m) have been observed to induce corona on the upper most parts of plants (McKee et al. 1978; Rogers et al. 1982). The induced corona causes minor damage to leaf tips. Studies of the effects of electric fields on crops and other plants have been conducted under controlled greenhouse conditions and under transmission lines. No reduction in growth of the crops was seen, except where the plants (mainly trees) grew very close to the conductors.

5.3 Livestock

Numerous studies have investigated the performance of livestock in the electrical environment of high voltage AC transmission lines. There are no indications that exposures to the fields beneath operating transmission lines affect livestock behavior or productivity. However, both AC and DC currents can cause definite behavioral responses in dairy and beef cattle. For this reason, metal water and feed troughs, like all conducting objects under the proposed line, should be grounded to eliminate the possibility of nuisance shocks.

6.0 Cardiac Pacemakers

Currents and voltages that are introduced internally to the body represent a possible source of interference to cardiac pacemakers. Internal currents can be caused by electric fields, by magnetic fields, or by direct between transmission line and ground, or between an appliance with inadequate grounding and ground.

The conclusion drawn from the research and reviews is that the overall risk to pacemaker wearers from transmission lines is minimal. This is especially true of 115 kV lines like the proposed Nucla-Telluride line because of the relatively low electric fields when compared to 500 and 765 kV lines. The threshold for interference to the most sensitive pacemakers is estimated to be 3.4 kV/m. Reversion of pacemakers is the most substantial effect noted to wearers of pacemakers and is not considered a serious problem. To date, no evidence has been found that a transmission line has caused a serious problem to the wearer of a pacemaker. In addition, pacemaker manufacturers have redesigned their pacemakers to be less sensitive to this problem in recent models.

7.0 Safety

The proposed line will be constructed to meet or exceed the NESC. Nevertheless, electrical equipment of any kind can be a safety hazard and special care must be taken when working or playing near transmission lines to avoid hazardous situations.

8.0 Hazards

8.1 Direct Electrical Contact

The greatest hazard from a power line is direct electrical contact with the conductors at any voltage. In fact, contact is more likely with lower voltage transmission lines because of their lower clearance as compared to higher voltage lines. Physical contact between a grounded object and the high voltage conductors is not necessary for electrical contact to be made. Arcing can occur across an air gap.

The following list of precautions indicates the care that must be taken near a high voltage line to avoid direct electrical contact. Extreme caution must be used when operating tall equipment, such as cranes or drilling equipment, near the line. Irrigation pipes and systems cannot be tipped up near the line. Trees near the transmission line should not be felled onto the conductors. Kites should not be flown near transmission lines and only nonmetallic string and kites should be used on dry days. The wind should carry the kite away from the transmission line. Towers should not be climbed.

If there is adequate clearance to the conductors of the proposed transmission line, then normal agricultural and other activities can be carried on safely.

8.2 Irrigation

Both fixed and mobile irrigation systems can be operated safely near transmission lines. However, certain precautions are necessary to minimize the hazards involved. The hazards associated with irrigation near transmission lines fall into three categories: direct contact, induced shocks, and transferred potential. With appropriate precautions, all can be minimized as a source of danger.

Direct contact is the most dangerous and, unfortunately, the most likely to occur without special precautions. Irrigation pipes are often long enough to reach within flashover distance of the conductors. Therefore, pipes should never be tipped up to remove dirt or small animals when in proximity to an overhead line. Equipment used to install irrigation systems can be tall; therefore, precautions should be taken to maintain adequate electrical clearance during installation. When moving a high-pressure system with long booms (such as a Vermeer mobile system), special precautions should be taken in ensure that it does not tip.

Steady streams of water contacting the energized conductors can provide a direct path to ground for leakage current or a flashover. Therefore, precautions should be taken to prevent steady water streams from striking the conductors. If this does happen, one should avoid contacting or being near the irrigation system. Thus, when a steady stream of water reaches a conductor, the water should be turned off at its source before correcting the problem. Nozzle risers in the vicinity of transmission lines should be equipped with spoilers or automatic shutoffs. High-volume, high-pressure systems have the potential to send a steady stream considerable distances. Safe operating distances for this type of equipment are based on several factors, including nozzle diameter and line voltage. Information is available to determine safe distances for this type of equipment.

Both electric field and magnetic field coupling can occur on irrigation systems. The former is easily reduced or eliminated by unloading and handling pipes away from the transmission line and by attaching only short lengths of pipe to a grounded header or riser.

Potentially hazardous, magnetically induced voltages can occur in long irrigation pipelines and maintenance of long pipes such as pivot systems should be done with the pipe perpendicular to the transmission line. In the event this orientation cannot be achieved, then the system should be grounded at each end. If the pipe is cut into sections, then each section should also be grounded.

To avoid the possibility of a transferred potential from the power system to the irrigation system during an electrical fault, buried portions of the irrigation system, or any pipeline, should not be too close to the tower or the tower grounding system.

In summary, irrigation near transmission lines can be hazardous to personnel if certain precautions are not taken. Cooperation between the landowner and the operator of the line is essential for safe operation.

8.3 Refueling

In a high electric field, it is theoretically possible for a spark discharge from the induced voltage on a large vehicle to ignite gasoline vapor during refueling. However, the probability for exactly the right conditions to occur for ignition is remote. According to results obtained from studies conducted by Johns Hopkins University, the ignition of fuel under a transmission line would require that an individual be standing on damp earth or vegetation and that the vehicle to be refueled must be exposed to the maximum intensity of the electric field. The vehicle must also be insulated. Finally, the air-fuel mixture must approach optimal flashpoint. Therefore, the number of precise conditions to be met to achieve fuel ignition reduces the likelihood of the occurrence. The report points out that "even if spark energies were sufficient to ignite fuel, then the person making the attempt would likely experience uncomfortable sparks, which would serve as a healthy warning of a potentially hazardous situation." For the Nucla-Telluride Line, the maximum electric field is low enough that it is very doubtful the right conditions could ever be achieved.

Because of the theoretical possibility of ignition, some utilities recommend that refueling not be done near transmission lines unless necessary. In the event refueling must be done under a line, grounding is recommended.

8.4 Fires

Large fires, including forest fires, near transmission lines represent a potential electrical hazard. The hot gases and smoke can create a conductive path to ground. If a flashover occurs along this path, then people near the fire could possibly experience dangerous shocks. Flashover also causes outages and jeopardizes the reliability of the transmission system.

Because of the hazards associated with fires, storing flammables, constructing flammable structures, and other activities that have the potential to cause or provide fuel for fires on rights-of-way will be prohibited.

8.5 Explosives

Use of explosives on or near the right-of-way can be affected by electrical interference from the power line to the circuits used for detonation. There is also a potential for damage to the transmission system.

8.6 Lightning

Transmission line towers, wires, and other tall objects are the most likely points to be hit

by lightning during a thunderstorm. The proposed Nucla-Telluride Line is designed with the overhead ground wires and well-grounded towers to protect the system from lightning. When the overhead ground wire or tower is hit, the lightning strike is conducted to ground at the tower. Since it is hazardous to be in the area where lightning enters the ground, it is advisable to stay away from the towers (and all tall objects such as trees) during electrical storms.

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